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FISHERIES

**STATEWIDE FISHERIES SURVEYS, 2006
SURVEYS OF PUBLIC WATERS
Part 1 Lakes Region III**

**South Dakota
Department of
Game, Fish and Parks
Wildlife Division
Joe Foss Building
Pierre, South Dakota 57501-3182**

**Progress Report
No. 07-10**

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STATEWIDE FISHERIES SURVEY, 2006

Survey of Public Waters

By

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Dave Lucchesi
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INTRODUCTION

Data gathered from May through October 2006 in State Management Region III are contained in this report. The Missouri River System and other State Management Regions are contained in separate reports.

OBJECTIVE

To survey waters where data is not sufficient to complete management plans or where optimum sport fishing yields are not realized under existing management and additional information is needed for plan update and remedial action.

PROCEDURE

Individual waters are surveyed to accumulate and update physical, chemical and biological data. A review of existing information accompanied new data collections. Information collected was recorded in a narrative type form developed for the South Dakota Fisheries Investigations Manual.

FINDINGS

The findings are contained in the following lake survey reports. This reporting method will allow for orderly collecting and recording data, making it available for completing and updating management plans, and evaluating current management practices.

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-39

Name: Cavour Lake **County:** Beadle
Legal Description: T111N- R60W-Sec. 20-22
Location from nearest town: 2-1/2 miles north of Cavour, SD

Dates of present survey: June 19-20, 2006
Date last surveyed: June 21-22, 2004

Primary Game and Forage Species	Secondary and Other Species
Black Crappie	Northern Pike
Walleye	Black Bullhead
Yellow Perch	Common Carp
	White Sucker
	Yellow Bullhead

PHYSICAL DATA

Surface Area: 230 acres **Watershed area:** 12.7 square miles
Maximum depth: 8 feet **Mean depth:** 4 feet
Volume: Unknown **Shoreline length:** Unknown
Contour map available: No **Date mapped:** NA
OHWM elevation: None set **Date set:** NA
Outlet elevation: None set **Date set:** NA
Lake elevation observed during the survey: 6 feet low
Beneficial use classifications: (6) warmwater marginal fish life propagation, (7) immersion recreation, (8) limited-contact recreation and (9) fish and wildlife propagation and stock watering.

Introduction

Italian railroad laborers working in the area named Cavour Lake for Count Cavour, an Italian statesman and father of Italian railroads. Water inputs come from a relatively small local watershed and the outlet empties into Pearl Creek and ultimately the James River.

Ownership of Lake and Adjacent Lakeshore Property

Cavour Lake is listed as meandered public water in the State of South Dakota Listing of Meandered Lakes. The South Dakota Department of Game, Fish and Parks (GFP) manages the fishery. GFP also owns and manages a Lake Access Area on the southeast corner of the lake and Game Production Areas on the north and south sides.

Fishing Access

The Cavour Lake Access Area contains a single lane, concrete plank boat ramp and a few areas suitable for shore fishing. The boat ramp is unusable at this time due to low water levels.

Field Observations of Water Quality and Aquatic Vegetation

The water in Cavour Lake was stained brown and turbid with about 20 cm (8 in) of visibility. No submergent or emergent aquatic vegetation was observed.

BIOLOGICAL DATA

Methods:

Cavour Lake was sampled on June 19-20, 2006 with two overnight gill-net sets and five overnight trap-net sets. The trap nets are constructed with 19-mm-bar-mesh ($\frac{3}{4}$ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh ($\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, and 2 in) monofilament netting. Gill-net and trap-net sites are displayed in Figure 3.

Results and Discussion:

Gill Net Catch

Common carp (63.0%) and black bullheads (26.9%) were the most abundant species sampled in the gill nets (Table 1). Other species sampled included walleye and black crappie.

Table 1. Total catch from two overnight gill net sets at Cavour Lake, Beadle County, June 19-20, 2006.

Species	Number	Percent	CPUE ¹	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Common Carp	75	63.0	37.5	± 0.6	31.0	6	1	86
Black Bullhead	32	26.9	16.0	± 3.8	80.0	0	0	79
Walleye	9	7.6	4.5	± 3.2	0.1	--	--	--
Black Crappie	3	2.5	1.5	± 1.9	0.7	--	--	--

* 5 years (1995, 1997, 2000, 2002, 2004)

Trap Net Catch

Black bullhead (73.8%), black crappie (13.3%) and common carp (9.9%) comprised the majority of the trap net sample (Table 2). Other species sampled included walleye, northern pike, yellow bullhead, and yellow perch.

¹ See Appendix A for definitions of CPUE, PSD, RSD-P, and mean Wr.

Table 2. Total catch from five overnight trap net sets at Cavour Lake, Beadle County, June 19-20, 2006.

Species	Number	Percent	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	649	73.8	129.8	+24.2	363.6	3	0	77
Black Crappie	117	13.3	23.4	+9.5	23.8	98	58	98
Common Carp	87	9.9	17.4	+8.4	8.4	43	35	81
Walleye	13	1.5	2.6	+1.3	0.0	15	8	85
Northern Pike	8	0.9	1.6	+0.9	2.3	--	--	--
Yellow Bullhead	4	0.5	0.8	+0.6	0.4	--	--	--
Yellow Perch	1	0.1	0.2	+0.6	0.0	--	--	--

* 7 years (1991, 1993, 1995, 1997, 2000, 2002, 2004)

Black Crappie

The Cavour Lake black crappie population exhibits the same cyclical tendencies we commonly see in other populations (Table 3). The trap-net catch has increased slightly since 2004 and the population is dominated by older fish (age-5; Table 4) longer than 25 cm (10 inches). Growth is similar to statewide, regional and large lake means and there was some natural reproduction each year from 2000 to 2004 (Table 4). Black crappies have not been stocked in the lake since 1995 (Table 6).

Table 3. Black crappie trap-net CPUE, PSD, RSD-P, and mean Wr for Cavour Lake, Beadle County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CPUE	20.2			63.8		65.0		14.0		23.4
PSD	98			71		100		94		98
RSD-P	18			7		66		77		58
Mean Wr	118			121		105		100		98

Table 4. Average back-calculated lengths (mm) for each age class of black crappie in Cavour Lake, Beadle County, 2006.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2004	2	2	73	175						
2003	3	17	73	147	215					
2002	4	13	89	155	201	227				
2001	5	82	98	164	212	239	253			
2000	6	3	88	136	209	247	265	291		
All Classes		117	84	155	209	237	259	291		
Statewide Mean			83	147	195	229	249			
Region III Mean			95	167	219	253	274			
LLI Mean			89	161	210	247	271			

*Large Lakes and Impoundments (>150 acres)

All Species

The high abundance of common carp along with low abundance of game fish continues to be a concern. Black bullhead abundance has shown a steady decline since 2000. Black crappies have replaced yellow perch as the dominant panfish species (Table 5).

Table 5. Gill-net (GN) and trap-net (TN) CPUE for all fish species sampled in Cavour Lake, Beadle County, 1997-2006.

Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
LMB (GN)	--			--		--		--		--
LMB (TN)	0.4			--		--		--		--
NOP (GN)	2.5			0.7		13.0		3.0		--
NOP (TN)	7.0			0.2		2.8		3.4		1.6
WAE (GN)	--			--		--		0.3		4.5
WAE (TN)	--			--		--		--		2.6
SXW (GN)	1.5			3.0		11.5		0.3		--
SXW (TN)	2.2			4.8		0.4		1.4		--
BLC (GN)	0.5			0.3		2.0		0.7		1.5
BLC (TN)	20.2			63.8		65.0		14.0		23.4
BLG (GN)	--			--		--		--		--
BLG (TN)	0.2			--		--		--		--
YEP (GN)	2.5			1.3		3.0		0.3		--
YEP (TN)	1.6			--		0.2		--		0.2
BLB (GN)	51.5			210.7		76.5		55.0		16.0
BLB (TN)	165.0			444.0		502.2		233.8		129.8
YEB (GN)	--			--		--		--		--
YEB (TN)	--			--		--		2.6		0.8
COC (GN)	26.5			13.3		47.0		28.7		37.5
COC (TN)	9.8			1.2		25.8		2.0		17.4
WHS (GN)	--			--		--		--		--
WHS (TN)	0.8			0.6		--		0.4		--

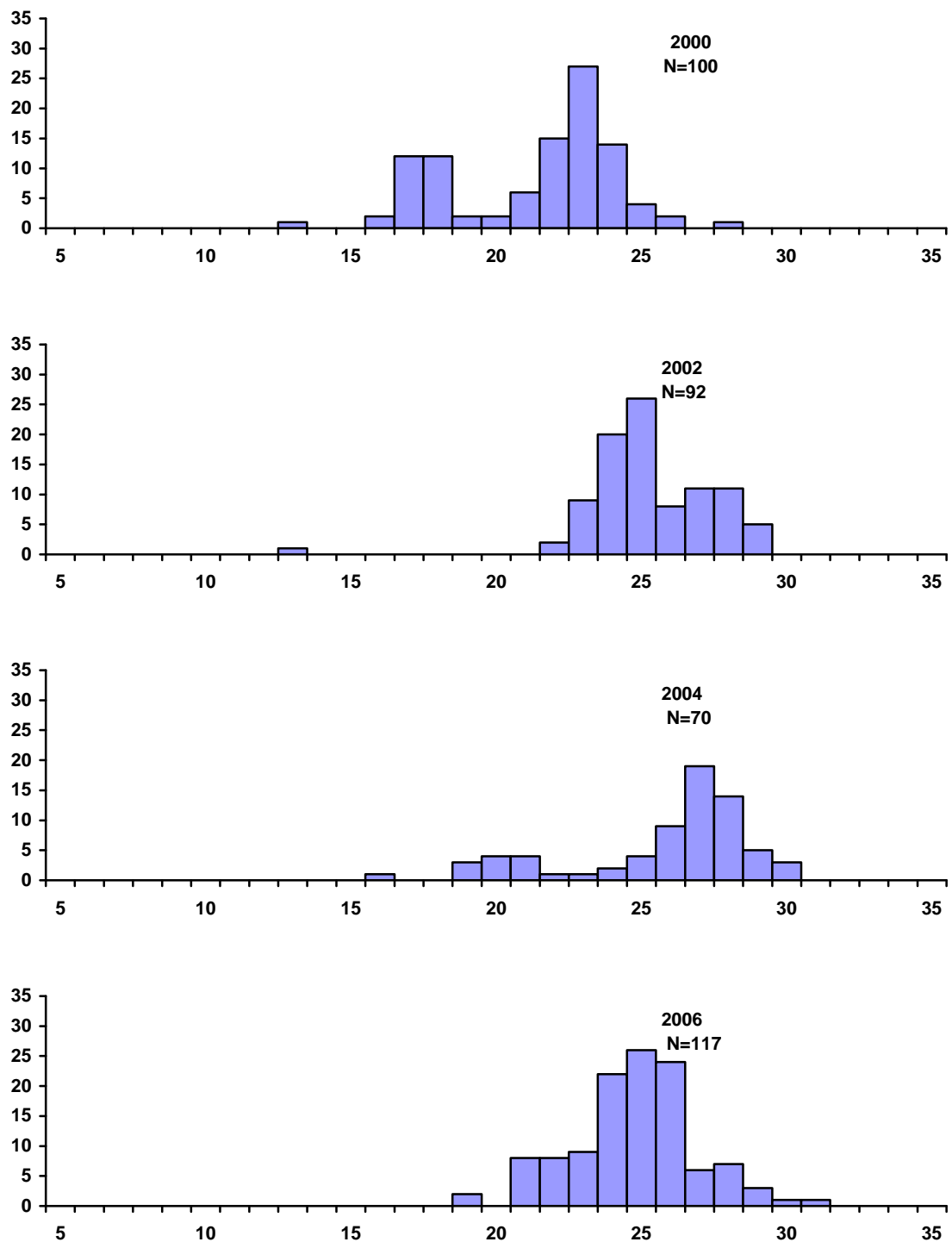
LMB (Largemouth Bass), NOP (Northern Pike), WAE (Walleye), SXW (Saugeye), BLC (Black Crappie), BLG (Bluegill), GSF (Green Sunfish), YEP (Yellow Perch), BLB (Black Bullhead), COC (Common Carp), WHS (White Sucker)

MANAGEMENT RECOMMENDATIONS

1. Low water levels are limiting management options at this time. Anglers can be encouraged to utilize the existing gamefish populations and attempts can be made to salvage usable fish but until water levels recover, stocking, fish surveys and other active management activities will be suspended.

Table 6. Stocking record for Cavour Lake, Beadle County, 1988-2006.

Year	Number	Species	Size
1988	3,410	Black Crappie	Adult
1990	6,300	Yellow Perch	Fingerling
	650	Yellow Perch	Adult
	3,024	Black Crappie	Adult
	700	Northern Pike	Adult
	117	Channel Catfish	Adult
1992	7,500	Northern Pike	Fingerling
	15,213	Yellow Perch	Fingerling
1994	160,000	Saugeye	Eggs
	300,000	Saugeye	Fry
	5,888	Saugeye	Lrg. Fingerling
1995	2,300	Black Crappie	Adult
	2,315	Yellow Perch	Adult
1996	562	Saugeye	Adult
	2,238	Yellow Perch	Adult
1997	17,556	Yellow Perch	Fingerling
1998	34,328	Saugeye	Fingerling
	1,469	Saugeye	Juvenile
2000	2,300	Yellow Perch	Adult
2001	26,100	Saugeye	Fingerling
2003	58,800	Walleye	Fingerling



Length-Centimeters

Figure 1. Length frequency histograms for black crappies sampled with trap nets in Cavour Lake, Beadle County, 2000, 2002, 2004, and 2006.

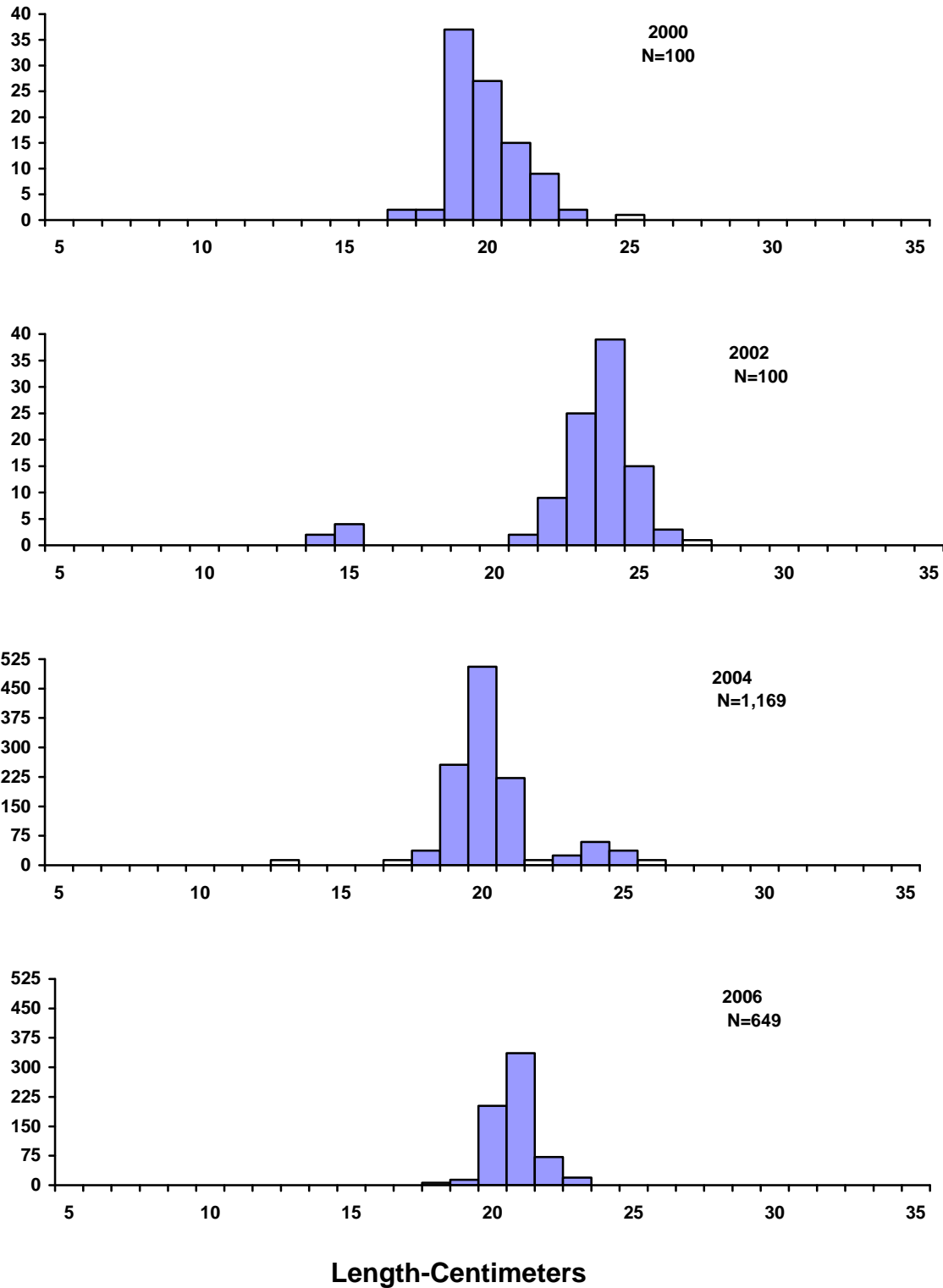
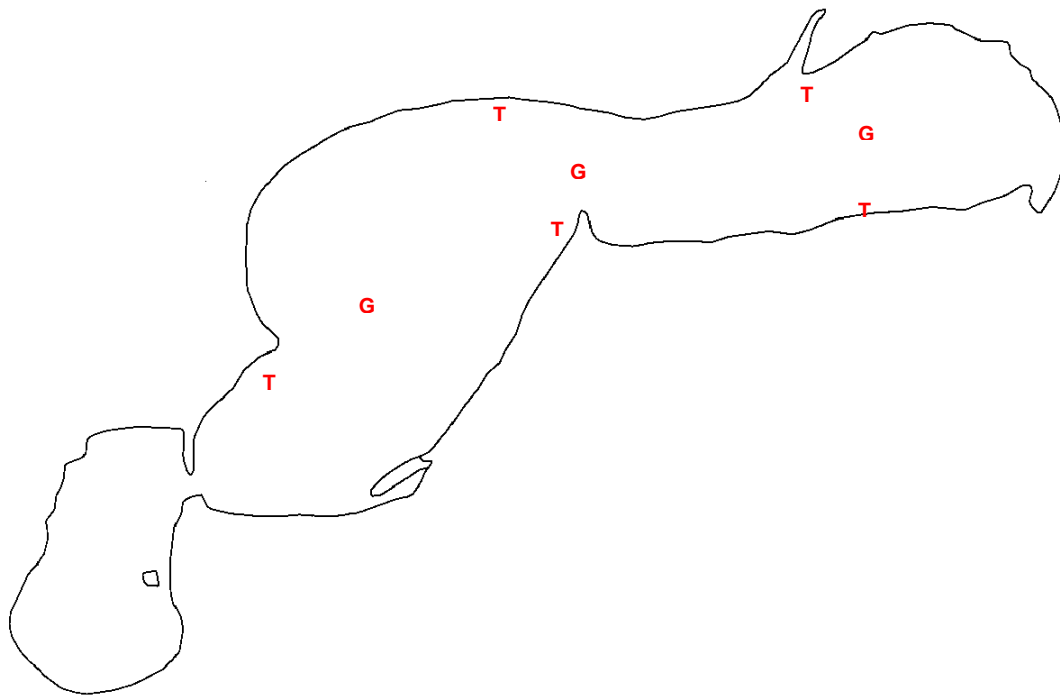


Figure 2. Length frequency histograms for black bullheads sampled with trap nets in Cavour Lake, Beadle County, 2002, 2004 and 2006.



Legend Gill Nets: G
Trap Nets: T

Figure 3. Sampling locations on Cavour Lake, Beadle County, 2006.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-39

Name: Staum Dam

County: Beadle

Legal Description: T113N- R59W- Sec14

Location from nearest town: 3 miles south, 1 mile east of Carpenter, SD

Dates of present survey: May 30, 2006

Date last surveyed: June 1, 2004

Primary Game and Forage Species	Other Species
Largemouth Bass	Black Bullhead
Bluegill	Hybrid Sunfish

PHYSICAL DATA

Surface Area: 46 acres

Watershed: 9,000 acres

Maximum depth: 16 feet

Mean depth: 6.5

Volume: Unknown

Shoreline length: 2.8 miles

Contour map available: Yes

Date mapped: 1970

Lake elevation observed during the survey: Full

Introduction

Staum Dam was constructed by the Works Progress Administration (WPA) around 1934. It was likely named for Edward Staum, who was the owner of the land the dam was constructed on. Staum, and other landowners, also provided public access easements for land underneath and surrounding the lake.

Ownership of Lake and Adjacent Lakeshore Property

Staum Dam is an artificial impoundment owned and managed by the South Dakota Department of Game, Fish, and Parks (GFP). Nearly the entire lake lies within a Game Production Area owned and managed by GFP.

Fishing Access

Staum Dam has a single lane, concrete boat ramp located on the southeast corner of the lake. The entire shoreline is publicly owned and accessible to shore fishing.

Field Observations of Water Quality and Aquatic Vegetation

The water in Staum dam was fairly clear during the 2006 survey; however, a Secchi depth measurement was not taken. Submergent vegetation was very dense in shallow water areas.

BIOLOGICAL DATA

Methods:

The fish population in Staum Dam was sampled by electrofishing at night for 80 minutes on May 30, 2006. Nearly the entire shoreline of the lake was sampled.

Results and Discussion:

Electrofishing Catch

Bluegill (50.6%), largemouth bass (39.7%), black bullhead (7.5%), green sunfish, and hybrid sunfish were sampled during this year's survey (Table 1).

Table 1. Total catch from 1.3 hours of nighttime electrofishing at Staum Dam, Beadle County, May 30, 2006.

Species	Number	%	CPUE ¹	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Bluegill	88	50.6	66.0	± 33.1	5.3	7	0	132
Largemouth Bass	69	39.7	51.8	± 16.3	119.9	77	52	104
Black Bullhead	13	7.5	9.8	± 3.6	95.2	85	85	109
Green Sunfish	3	1.7	0.8	± 2.9	0.0	--	--	--
Hybrid Sunfish	1	0.6	0.8	± 1.0	1.2	--	--	--

* Two years (2000, 2004)

Largemouth Bass

Management objective: Maintain a largemouth bass fishery with an electrofishing CPUE of at least 20.

Largemouth bass abundance exceeded our management objective since 2000 (Table 2). The presence of five year classes produced since the last stocking in 1999 (Table 6) suggests consistent natural reproduction (Table 3). However, the abundance of smaller bass relative to larger fish was relatively low (Figure 1) suggesting that recruitment in recent years has been limited, possibly by cannibalism. Growth is above average for South Dakota waters and similar to the regional mean (Table 3).

Table 2. Largemouth bass electrofishing CPUE, PSD, RSD-P and mean Wr for Staum Dam, Beadle County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CPUE		0.0		156.5				83.3		51.8
PSD		--		46				43		77
RSD-P		--		3				27		52
Mean Wr		--		122				102		104

¹ See Appendix A for definitions of CPUE, PSD, and mean Wr.

Table 3. Average back-calculated lengths (mm) for each age class of largemouth bass in Staum Dam, Beadle County, 2006.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2005	1	4	146							
2004	2	15	103	253						
2002	4	3	126	234	322	366				
2001	5	17	103	169	236	319	374			
2000	6	17	121	249	314	360	396	419		
1999	7	10	106	185	262	319	362	395	414	
1998	8	2	122	233	324	362	405	426	441	450
1997	9	1	98	165	242	361	380	408	446	458
All Classes		69	116	213	283	348	383	412	434	454
Statewide Mean			96	182	250	305	342			
Region III Mean			111	212	287	347	383			
SLI* Mean			99	183	246	299	332			

*Small Lakes and Impoundments (<150 acres)

Bluegill

Management objective: Maintain a bluegill fishery with an electrofishing CPUE of at least 50 and RSD-18 of at least 20.

Bluegill electrofishing CPUE exceeded our management objective this year (Table 4). The fish sampled ranged in length from 30-180 mm (1-7 in) (Table 4) and growth was similar to statewide, regional, and SLI means (Table 5). No age-1 or age-2 bluegills were sampled in 2004 which explains the scarcity of age 3-4 fish in the 2006 sample and also the reason we have not attained PSD and RSD-18 objectives at this time.

Table 4. Bluegill electrofishing CPUE, PSD, RSD-18, RSD-P and mean Wr for Staum Dam, Beadle County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CPUE		0.0		0.0				10.5		66.0
PSD		--		--				36		7
RSD-18		--		--				0		5
RSD-P		--		--				0		0
Mean Wr		--		--				128		132

Table 5. Average back-calculated lengths (mm) for each age class of bluegill in Staum Dam, Beadle County, 2006.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2005	1	43	51							
2004	2	28	44	107						
2003	3	5	48	101	141					
2002	4	1	43	100	140	177				
All Classes		77	46	102	140	177				
Statewide Mean			55	103	141	166	180			
Region III Mean			60	116	157	180	190			
SLI* Mean			53	101	138	163	180			

*Small Lakes and Impoundments (>150 acres)

Black Bullhead

Management objective: Maintain a black bullhead population with an electrofishing CPUE of less than 100.

Although once over-populated with small bullheads, Staum Dam now supports a low density, high quality (PSD=85, RSD-P=85) population (Table 1 and Figure 3). Predation by abundant largemouth bass seems to be keeping bullhead recruitment under control.

MANAGEMENT RECOMMENDATIONS

1. Conduct another electrofishing survey in 2008 to monitor the fishery.

Table 6. Stocking record for Staum Dam, Beadle County, 1990-2006.

Year	Number	Species	Size
1992	6,000	Largemouth Bass	Med. Fingerling
1998	28	Largemouth Bass	Adult
	6,900	Largemouth Bass	Fingerling
1999	465	Largemouth Bass	Adult
	4,600	Largemouth Bass	Fingerling
2000	320	Bluegill	Fingerling
	380	Bluegill	Adult
2002	52,480	Bluegill	Fingerling
	860	Bluegill	Adult

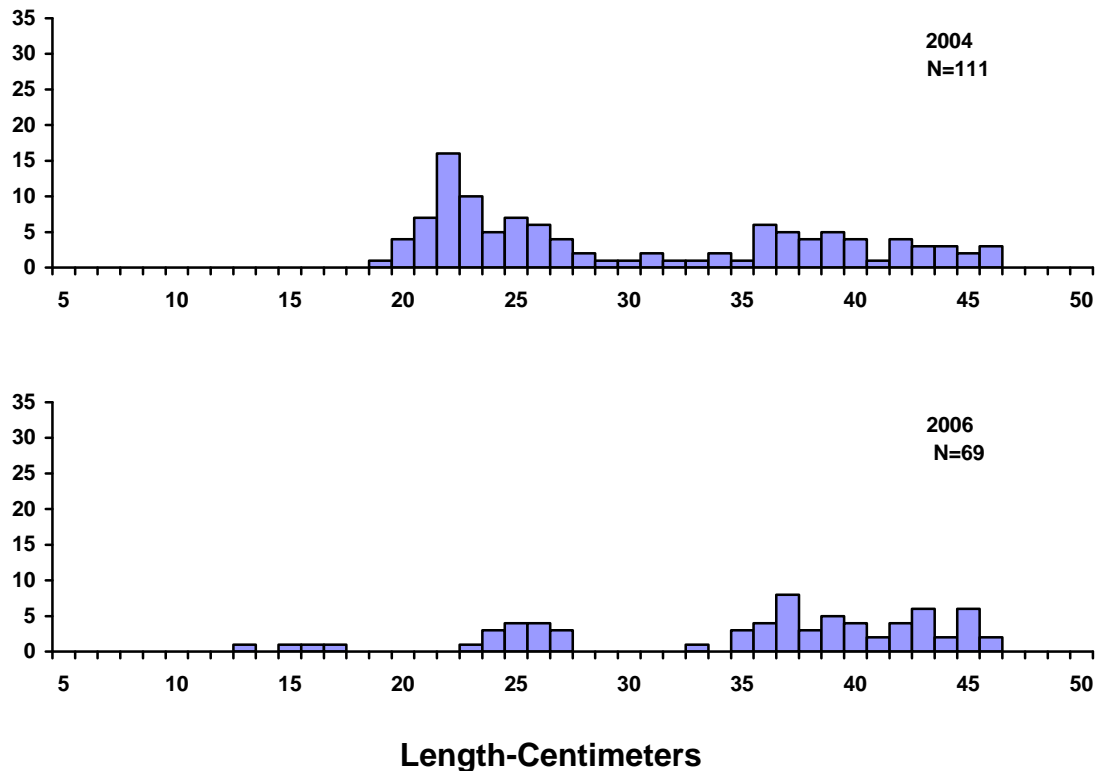
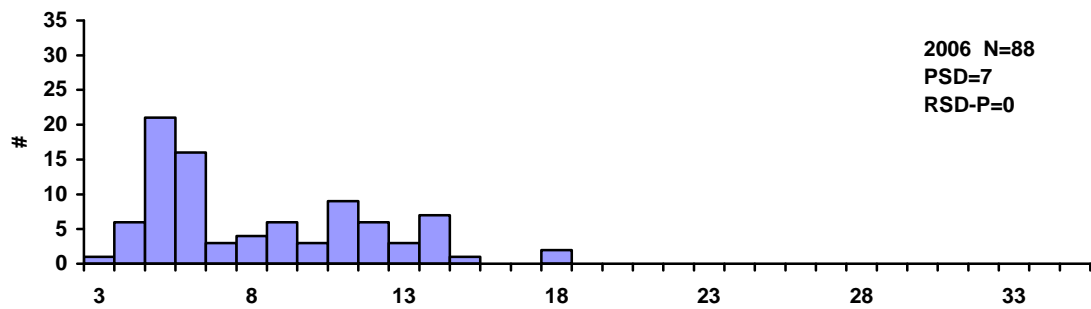
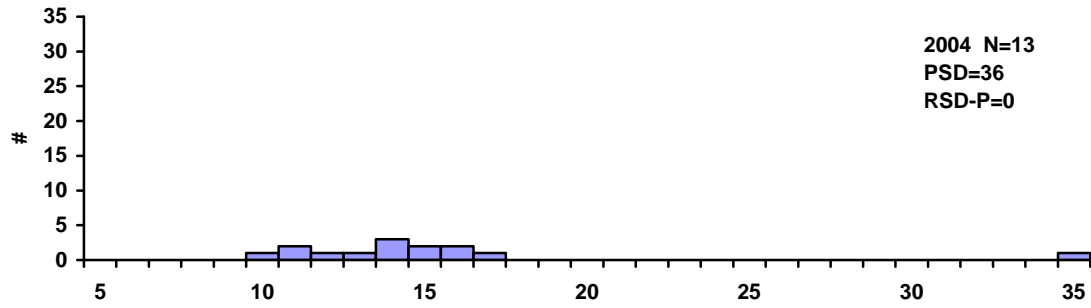


Figure 1. Length frequency histograms for largemouth bass sampled by electrofishing in Staum Dam, Beadle County, 2004 and 2006.



Length-Centimeters

Figure 2. Length frequency histograms for bluegills sampled by electrofishing in Staum Dam, Beadle County, 2004 and 2006.

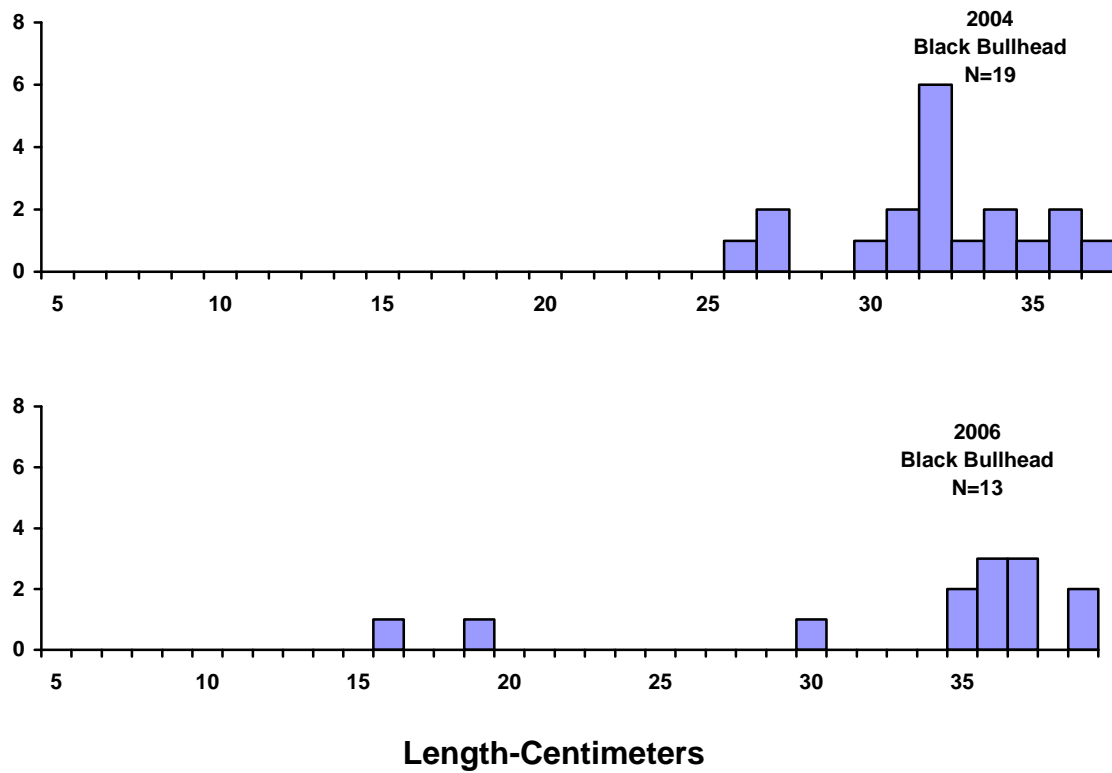


Figure 3. Length frequency histograms for black bullheads sampled by electrofishing in Staum Dam, Beadle County, 2004 and 2006.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F21-R-39

Name: Brush Lake **County:** Brookings
Legal Description: T110N-R52W-Sec. 3, 9, 10, 11
Location from nearest town: 2 miles south, ½ mile east of Arlington, SD

Dates of present survey: July 5-6, 2006
Date last surveyed: July 7-8, 2004

Primary Game and Forage Species	Secondary and Other Species
Walleye	Northern Pike
Yellow Perch	Black Bullhead
	Green Sunfish
	White Sucker

PHYSICAL DATA

Surface Area: 386 acres **Watershed area:** Unknown
Maximum depth: Unknown **Mean depth:** Unknown
Contour map available: No **Date mapped:** NA
Beneficial use classifications: (9) fish and wildlife propagation, recreation and stock watering.

Ownership of lake and adjacent lakeshore properties:

Brush Lake is listed as a meandered lake in the State of South Dakota Listing of Meandered Lakes and the fishery is managed by the South Dakota Department of Game, Fish, and Parks (GFP). Most of the east and south shoreline is owned by the United States Fish and Wildlife Service. The north shore is considered a public right-of-way for US Highway 14. The remainder of the shoreline is privately owned.

Fishing Access:

There is a grassy shoreline on the south shore of the lake where small boats can be launched with difficulty. There are areas suitable for shore fishing on the public properties described above.

Field Observations of Water Quality and Aquatic Vegetation:

Water quality during the survey was good with a Secchi depth measurement of 48 in. Dense beds of sago pondweed (*Potamogeton pectinatus*), clasping leaf pondweed (*Potamogeton richardsonii*) and water milfoil (*Myriophyllum verticillatum*) were observed around the entire shoreline. Cattail is common in shallow bays. Some areas had green and blue-green algae floating on the surface.

BIOLOGICAL DATA

Methods:

Brush Lake was sampled on July 5-6, 2006 with three overnight gill-net sets and five overnight trap-net sets. The trap nets are constructed with 19-mm-bar-mesh ($\frac{3}{4}$ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh ($\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, and 2 in) monofilament netting. Sampling sites are displayed in Figure 2.

Results and Discussion:

Gill Net Catch

Walleye comprised 73.7% of the gill net sample followed by black bullhead at 19.9% (Table 1). Yellow perch, yellow bullhead, northern pike, and white sucker were the only other species caught.

Table 1. Total catch from three overnight gill net sets at Brush Lake, Brookings County, July 5-6, 2006

Species	Number	Percent	CPUE ¹	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Walleye	278	73.7	92.7	± 11.3	11.6	18	1	98
Black Bullhead	75	19.9	25.0	± 6.7	87.8	4	1	103
Yellow Perch	10	2.7	3.3	± 0.4	30.6	30	30	97
Yellow Bullhead	6	1.6	2.0	± 2.6	0.0	--	--	--
Northern Pike	4	1.1	1.3	± 0.4	3.7	--	--	--
White Sucker	4	1.1	1.3	± 1.1	0.3	--	--	--

* Three years (2000, 2002, 2004).

Trap Net Catch

Black bullheads comprised 93.4% of the trap net sample followed by walleye, white sucker, northern pike, yellow perch, yellow bullhead, and green sunfish (Table 2).

¹ See Appendix A for definitions of CPUE, PSD, RSD-P and mean Wr.

Table 2. Total catch from five overnight trap net sets at Brush Lake, Brookings County, July 5-6, 2006.

Species	No.	%	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	1,041	93.4	208.2	± 64.3	294.3	1	1	90
Walleye	30	2.7	6.0	± 3.7	1.1	59	28	98
White Sucker	19	1.7	3.8	± 3.7	0.1	100	100	96
Northern Pike	15	1.3	3.0	± 0.8	4.0	73	20	94
Yellow Perch	4	0.4	0.8	± 0.5	0.0	--	--	--
Yellow Bullhead	4	0.4	0.8	± 0.6	0.0	--	--	--
Green Sunfish	1	0.1	0.2	± 0.3	0.0	--	--	--

* 3 years (1996, 2000, 2004)

Walleye

Management objective: Maintain a walleye fishery with a gill-net CPUE of at least 15, PSD range of 30-60 and a growth rate of 35.4 cm (14 in) in 3 years.

Walleye gill-net CPUE was extremely high (Table 3); however, less than 20% of the fish sampled were longer than 38 cm (15 inches) while a high percentage were yearlings (Table 4). All year classes coincided with stocked years which indicates that stocking is maintaining this population. Growth is excellent with fish exceeding 35.6 cm (14 in) between age-2 and age-3 (Table 4) and the fish were in good condition with a mean Wr of 98.

Table 3. Walleye gill-net CPUE, PSD, RSD-P, and mean Wr for Brush Lake, Brookings County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE				15.7		13.0		6.0		92.7	11.6
PSD				37		97		50		18	61
RSD-P				0		0		33		1	11
Mean Wr				82		105		91		98	93

*3 years (2000, 2002, 2004)

Table 4. Average back-calculated lengths (mm) for each age class of walleye in Brush Lake, Brookings County, 2006.

Back-calculation Age										
Year Class	Age	N	1	2	3	4	5	6	7	8
2005	1	213	201							
2004	2	57	157	346						
2002	4	8	210	355	430	482				
All Classes		278	189	350	430	482				
Statewide Mean			168	279	360	425	490			
Region III Mean			173	281	367	435	517			
LLI* Mean			169	280	358	425	494			

*Large Lakes and Impoundments (>150 acres)

Yellow Perch

Management objective: Maintain a yellow perch population with a gill-net CPUE of at least 50 with a PSD range of 30-60.

Nearly 15,000 juvenile (38/lb) yellow perch were stocked in April 2002 (Table 8). The stocked fish were sampled in good numbers later in 2002 (Figure 2), however, by 2004, gill-net CPUE of the stocked fish and the rest of the population had diminished significantly for unknown reasons (Table 5, Figure 2).

Table 5. Yellow perch gill-net CPUE, PSD, RSD-P, and mean Wr for Brush Lake, Brookings County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE				33.3		54.7		3.7		3.3	30.6
PSD				28		49		45		30	41
RSD-P				1		6		0		30	2
Mean Wr				100		95		100		97	98

*3 years (2000, 2002, 2004)

Black Bullhead

Management objective: Maintain a black bullhead population with a trap-net net CPUE of less than 100.

Black bullhead trap-net CPUE increased in 2006 (Table 6) and the fish sampled ranged in length from 13 to 22 cm (5.0 to 8.7 in) (Figure 1). Hopefully the large walleye population will be able to keep black bullhead numbers under control.

Table 6. Black bullhead gill-net CPUE, PSD, RSD-P and mean Wr for Lake Campbell, Brookings County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CPUE				703.0				14.2		208.2
PSD				12				19		1
RSD-P				0				17		1
Mean Wr				--				93		90

All Species

Brush Lake contains good numbers of game fish and very few undesirable fish. No carp or buffalo have been sampled in Brush Lake (Table 7).

Table 7. Gill-net (GN) and trap-net (TN) CPUE for all fish species sampled in Brush Lake, Brookings County, 1997-2006.

Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
NOP (GN)				2.0		6.3		2.7		1.3
NOP (TN)				1.0		--		1.8		3.0
WAE (GN)				15.7		13.0		6.0		92.7
WAE (TN)				1.4		--		2.0		6.0
GSF (GN)				--		--		--		--
GSF (TN)				0.2		--		--		0.2
YEP (GN)				33.3		54.7		3.7		3.3
YEP (TN)				5.0		--		--		0.8
BLB (GN)				167		93.7		2.7		25.0
BLB (TN)				703		--		14.2		208.2
YEB (GN)				--		--		--		2.0
YEB (TN)				--		--		--		0.8
WHS (GN)				--		--		1.0		1.3
WHS (TN)				--		--		0.2		0.8

NOP (Northern Pike), WAE (Walleye), GSF (Green Sunfish), YEP (Yellow Perch), BLB (Black Bullhead), YEB (Yellow Bullhead), WHS (White Sucker).

MANAGEMENT RECOMMENDATIONS

1. Stock walleye fingerlings at a rate of 100/acre (25,800) as needed to accomplish the management objective.
2. Stock yellow perch adults at a rate of 10/acre (3,860) as needed to accomplish the management objective.
3. Evaluate all management activities by conducting lake surveys every other year.
4. Investigate the possibility of establishing a simple boating access area on the south end of lake.

Table 8. Stocking record for Brush Lake, Brookings County, 1990-2006.

Year	Number	Species	Size
1992	130,000	Northern Pike	Fry
	827	Northern Pike	Adult
1997	3,280	Yellow Perch	Adult
1998	40,000	Walleye	Fingerling
	2,025	Yellow Perch	Adult
1999	30,000	Walleye	Fingerling
2001	4,572	Yellow Perch	Adult
2002	31,140	Walleye	Fingerling
	14,896	Yellow Perch	Juvenile
2004	44,400	Walleye	Fingerling
2005	38,600	Walleye	Fingerling
2006	40,220	Walleye	Fingerling
	435	Yellow Perch	Adult

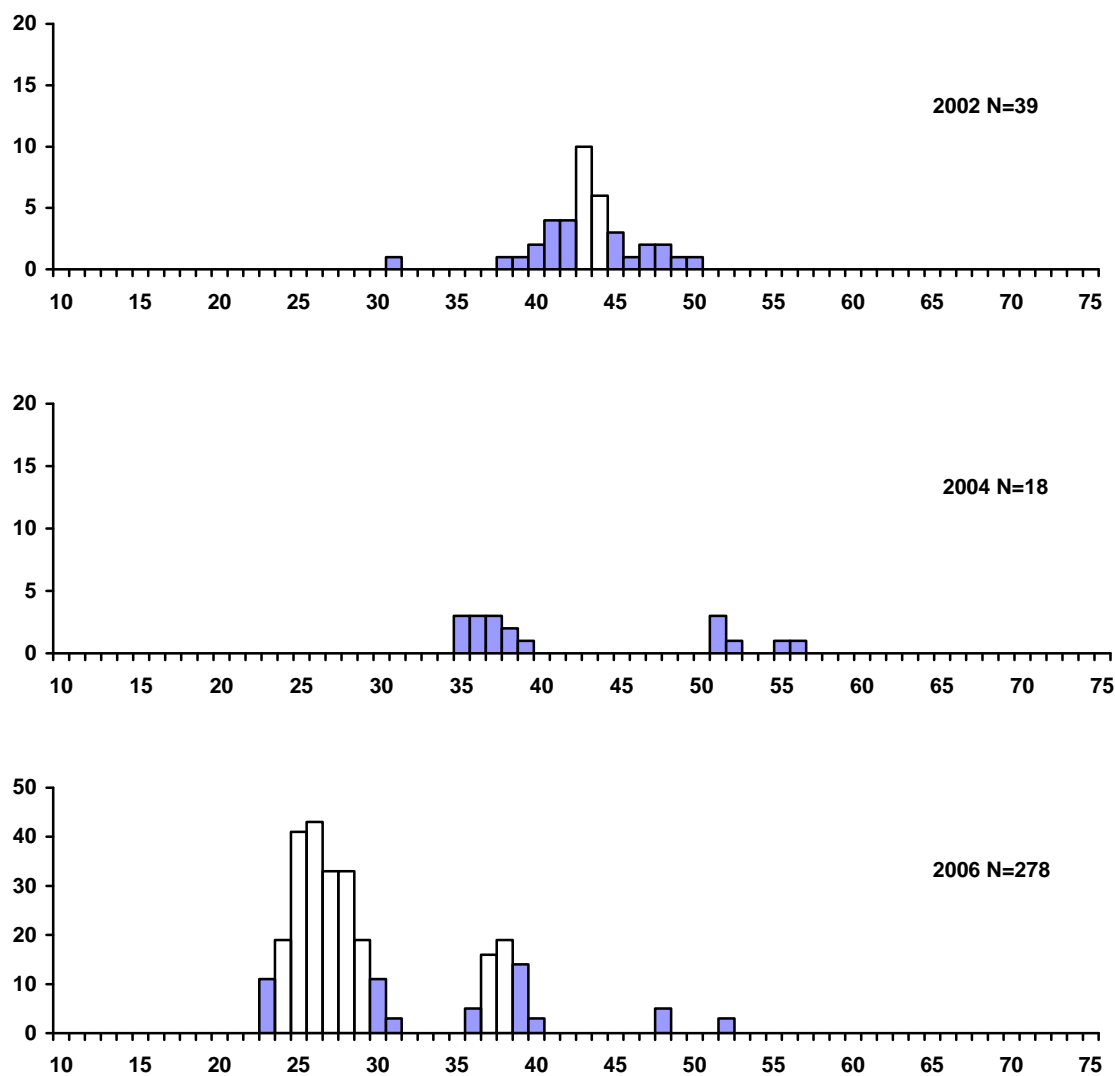


Figure1. Length frequency histograms of walleye from Brush Lake, Brookings County, 2002, 2004 and 2006.

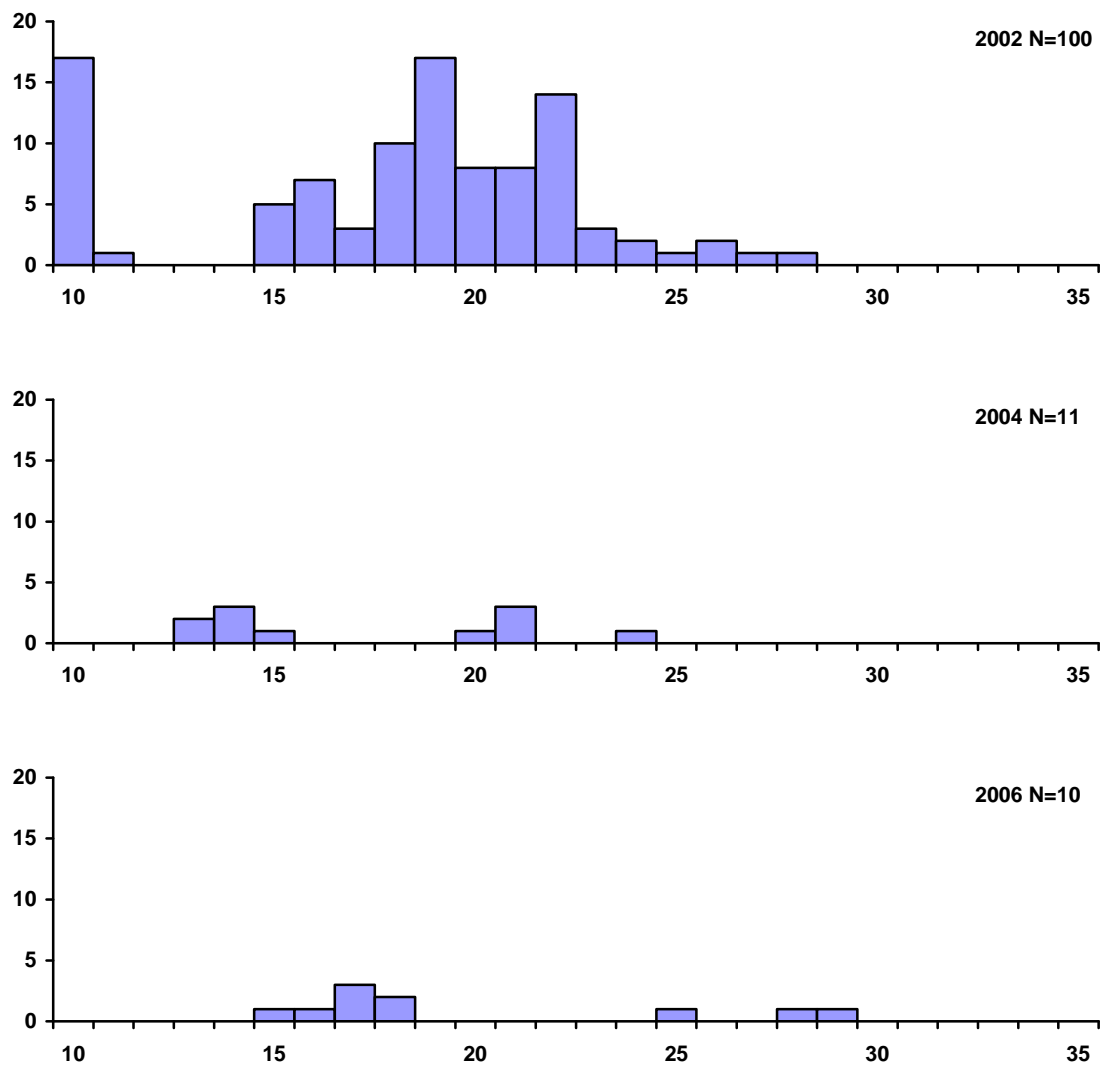


Figure 2. Length frequency histograms of yellow perch from Brush Lake, Brookings County, 2002, 2004 and 2006.

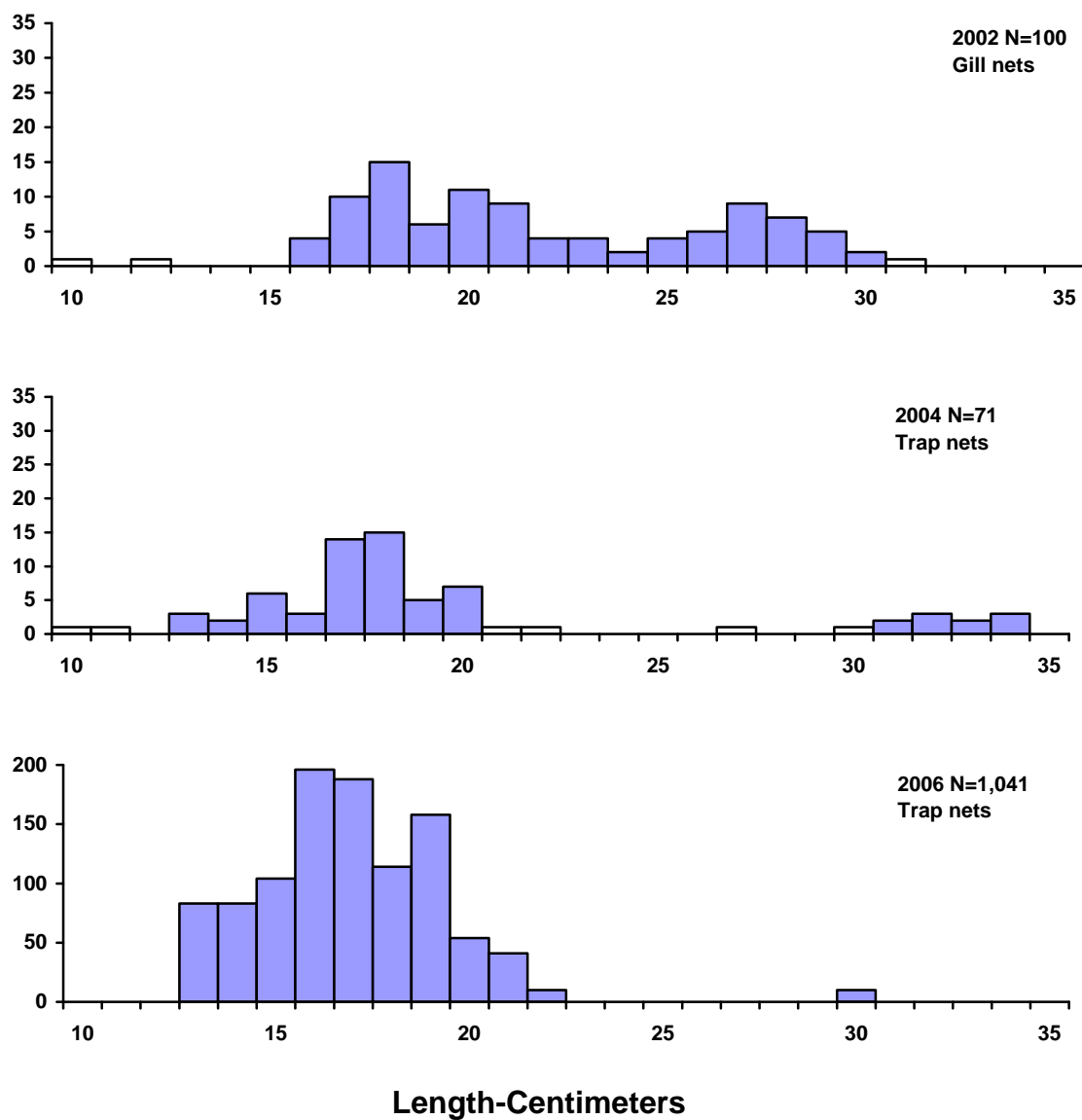
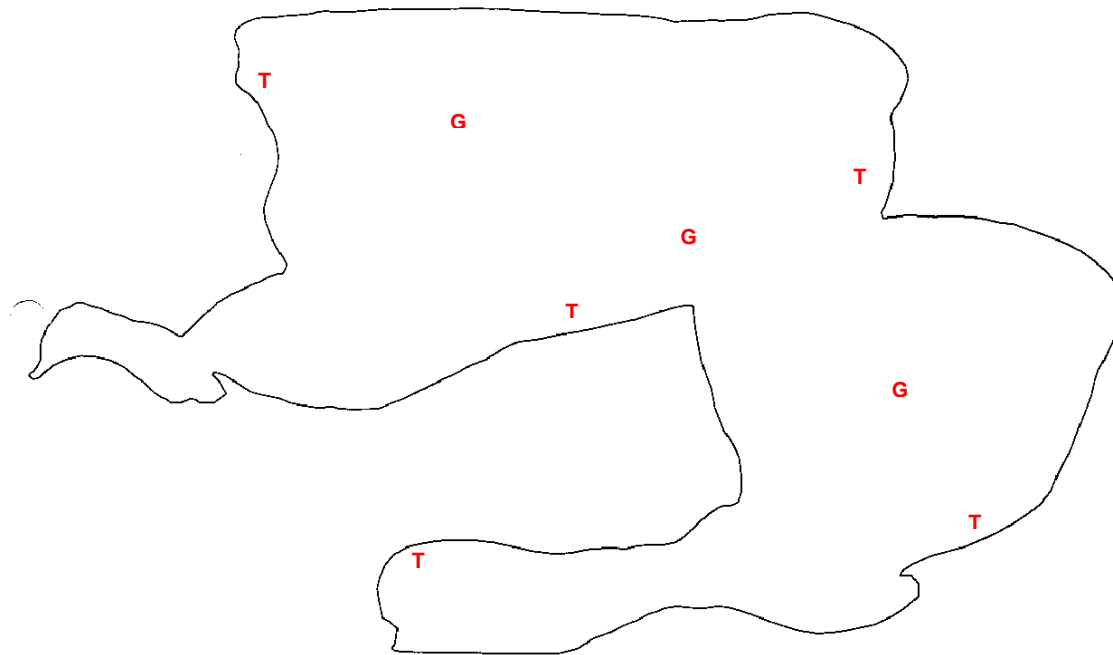


Figure 3 Length frequency histograms of black bullheads from Brush Lake, Brookings County, 2002, 2004 and 2006.



Legend Gill Net Sites: **G**
Trap Net Sites: **T**

Figure 2. Sampling locations on Brush Lake, Brookings County, 2006.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-39

Name: Lake Campbell

County: Brookings

Legal Description: T109N- R50W- Sec. 28, 29, 32, 33; T108N- R50W-Sec. 5

Location from nearest town: 6 miles south and 2 miles west of Brookings, SD

Dates of present survey: June 28-30, 2006

Dates of last survey: July 5-7, 2004

Primary Game and Forage Species	Secondary and Other Species
Walleye	Northern Pike
Yellow Perch	White Bass
	Bluegill
	Channel Catfish
	White Sucker
	Common Carp
	Bigmouth Buffalo
	Black Crappie
	Black Bullhead
	Shorthead Redhorse

PHYSICAL DATA

Surface area: 1,000 acres

Maximum depth: 7 feet

Volume: 4,000 acre feet

Contour map available: Yes

OHWM elevation: 1575.7

Outlet elevation: 1575.2

Lake elevation observed during the survey: Full

Beneficial use classifications: (6) warmwater marginal fish life propagation, (7) immersion recreation, (8) limited-contact recreation and (9) wildlife propagation and stock watering.

Watershed area: 103,762 acres

Mean depth: 4 feet

Shoreline length: 7.2 miles

Date mapped: 1996

Date set: April, 1983

Date set: April, 1983

Introduction

Lake Campbell was named after Albert H. Campbell of the Pacific Wagon Railroad. The lake lies on the downstream end of the Badus-Battle Creek drainage which flows into the Big Sioux River and ultimately, the Missouri River. The watershed is mostly cropland which contributes a heavy silt load to the lake whenever runoff occurs. As a result, Lake Campbell is very shallow, water quality is poor and fish kills are frequent.

Ownership of Lake and Adjacent Lakeshore Properties

Lake Campbell is listed as meandered public water in the State of South Dakota Listing of Meandered Lakes and the fishery is managed by the South Dakota Department of Game, Fish and Parks (GFP). GFP also owns and manages an access area on the north end of the lake. There is a road right-of-way on the south end of the lake owned by Moody County and open for public access. The remainder of the shoreline is privately owned.

Fishing Access

The North Shore Access Area contains a new concrete plank boat ramp, boat dock and a handicapped-accessible fishing pier. A vault toilet will be installed in the near future. There are several areas suitable for shore fishing on this area as well. Shore fishing also occurs off the bridge and shoreline on the south end of the lake.

Field Observations of Water Quality and Aquatic Vegetation:

The water in Lake Campbell was fairly turbid during the survey with Secchi depth measurement of 30.5 cm (12 in). A few scattered beds of sago pondweed (*Potamogeton pectinatus*) were observed in shallow areas.

BIOLOGICAL DATA

Methods

Lake Campbell was sampled on June 28-30, 2006 with two overnight gill net sets and ten overnight trap-net sets. The trap nets are constructed with 19-mm-bar-mesh ($\frac{3}{4}$ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh ($\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, and 2 in) monofilament netting. Gill net and trap net sites are displayed in Figure 3.

Results and Discussion

Gill Net Catch

Walleyes (38.1%) were the most abundant species sampled in the gill nets (Table 1). Other species caught included black bullhead, white sucker, common carp, spottail shiner, shorthead redhorse, orange-spotted sunfish, northern pike, and yellow perch.

Table 1. Total catch from two overnight gill net sets at Lake Campbell, Brookings County, June 28-30, 2006.

Species	Number	Percent	CPUE ¹	80% C.I.	Mean CPUE *	PSD	RSD-P	Mean Wr
Walleye	40	38.1	20.0	± 2.6	7.4	93	0	102
Black Bullhead	22	21.0	11.0	± 1.3	53.6	0	0	100
White Sucker	22	21.0	11.0	± 6.4	12.2	50	32	101
Common Carp	13	12.4	6.5	± 4.5	6.9	--	--	--
Spottail Shiner	3	2.9	1.5	± 0.6	1.3	--	--	--
Shorthead Redhorse	2	1.9	1.0	± 0.0	0.3	--	--	--
O. S. Sunfish	1	1.0	0.5	± 0.6	0.0	--	--	--
Northern Pike	1	1.0	0.5	± 0.6	4.3	--	--	--
Yellow Perch	1	1.0	0.5	± 0.6	34.3	--	--	--

* 6 years (1994, 1996, 1998, 2000, 2002, 2004)

Trap Net Catch

Black bullheads made up 97.5% of the trap net catch (Table 2). Other species sampled included bigmouth buffalo, common carp, walleye, yellow bullhead, northern pike, white sucker, channel catfish, green sunfish, orange-spotted sunfish, and stonecat.

Table 2. Total catch from ten overnight trap net sets at Lake Campbell, Brookings County, June 28-30, 2006.

Species	Number	Percent	CPUE	80% C.I.	Mean CPUE *	PSD	RSD-P	Mean Wr
Black Bullhead	11,627	97.5	1,162.7	± 314.6	714.9	0	0	102
Bigmouth Buffalo	120	1.0	12.0	± 5.2	7.6	95	23	97
Common Carp	69	0.6	6.9	± 2.3	4.5	53	18	109
Walleye	47	0.4	4.7	± 2.3	1.4	87	4	100
Yellow Bullhead	40	0.3	4.0	± 1.6	0.3	90	25	115
Northern Pike	9	0.1	0.9	± 0.4	3.7	--	--	--
White Sucker	6	0.1	0.6	± 0.5	2.5	--	--	--
Channel Catfish	4	0.0	0.4	± 0.2	0.7	--	--	--
Green Sunfish	4	0.0	0.4	± 0.2	0.0	--	--	--
O. S. Sunfish	1	0.0	0.1	± 0.1	0.0	--	--	--
Stonecat	1	0.0	0.1	± 0.1	0.0	--	--	--

* 7 years (1992, 1994, 1996, 1998, 2000, 2002, 2004)

* See Appendix A for definitions of CPUE, PSD, RSD-P and mean Wr

Walleye

Management objective: Maintain a walleye population with a gill-net CPUE of at least 10, a PSD range of 30-60, and a growth rate of 14 inches by age-3.

The walleye population in Lake Campbell is currently meeting our management objective (Table 3). Walleye fingerlings were stocked in 2004 to reestablish the walleye population after a partial winterkill in 2003-04. Only age-2 walleyes from this stocking were sampled, indicating that few, if any, older fish survived the winterkill. A good year class was created by the fingerling stocking and growth is excellent with fish reaching 36 cm (14 inches) in two years (Table 4) (Figure 1). An additional fry stocking was made in 2006 (Table 8).

Table 3. Walleye gill-net CPUE, PSD, RSD-P and mean Wr for Lake Campbell, Brookings County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CPUE		18.0		5.5		12.0		0.0		20.0
PSD		93		90		0		--		93
RSD-P		7		70		0		--		0
Mean Wr		92		92		100		--		102

Table 4. Average back-calculated lengths (mm) for each age class of walleye in Lake Campbell, Brookings County, 2006.

		Back-calculation Age								
Year Class	Age	N	1	2	3	4	5	6	7	8
2004	2	40	176	361						
All Classes		40	176	361						
Statewide Mean			168	279	360	425	490			
Region III Mean			173	281	367	435	517			
LLI Mean*			169	280	358	425	494			

*Large Lakes and Impoundments (>150 acres)

Yellow Perch

Management objective: Maintain a yellow perch population with a gill-net CPUE of at least 50 with a PSD range of 30-60.

Only one yellow perch was sampled in the gill nets (Table 5) suggesting that the 2004 fingerling stocking (Table 8) was unsuccessful.

Table 5. Yellow perch gill-net CPUE, PSD, RSD-P and mean Wr for Lake Campbell, Brookings County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CPUE		91.3		151.5		19.0		1.5		0.5
PSD		10		22		72		--		--
RSD-P		0		0		32		--		--
Mean Wr		115		92		104		--		--

Black Bullhead

Management objective: Maintain a black bullhead population with a trap-net net CPUE of less than 100.

Black bullhead trap-net CPUE declined slightly in 2006 (Table 6). However, 85% of the fish sampled were less than 5 cm (6 in) long (Figure 2) which makes them useless to commercial fishermen or anglers.

Table 6. Black bullhead gill-net CPUE, PSD, RSD-P and mean Wr for Lake Campbell, Brookings County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CPUE		170.6		72.2		2,174.7		1,359.5		1,162.7
PSD		--		77		6		27		0
RSD-P		--		0		0		3		0
Mean Wr		--		92		99		95		102

All Species

Lake Campbell has the highest species diversity of any lake in the Region (Table 7).

Table 7. Gill-net (GN) and trap-net (TN) CPUE for all fish species sampled in Lake Campbell, Brookings County, 1997-2006.

Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CCF (GN)	--	--	0.5	--	--	--	--	--	--	--
CCF (TN)	1.4	--	--	1.0	--	--	--	--	0.4	--
STC (GN)	--	--	--	--	--	--	--	--	--	--
STC (TN)	--	--	--	--	--	--	--	--	0.1	--
NOP (GN)	0.3	1.5	7.3	2.0	0.5	--	--	--	--	--
NOP (TN)	1.6	1.3	7.9	5.1	0.9	--	--	--	--	--
WAE (GN)	18.0	5.5	12.0	--	20.0	--	--	--	--	--
WAE (TN)	2.1	2.3	1.9	--	4.7	--	--	--	--	--
WHB (GN)	--	4.5	1.0	--	--	--	--	--	--	--
WHB (TN)	1.8	7.9	1.7	--	--	--	--	--	--	--
BLC (GN)	--	2.0	--	--	--	--	--	--	--	--
BLC (TN)	2.0	5.4	0.3	--	--	--	--	--	--	--
BLG (GN)	--	--	--	--	--	--	--	--	--	--
BLG (TN)	--	0.2	0.1	--	--	--	--	--	--	--
WHC (GN)	1.7	1.5	--	--	--	--	--	--	--	--
WHC (TN)	1.3	6.4	--	--	--	--	--	--	--	--
GSF (GN)	--	--	--	--	--	--	--	--	--	--
GSF (TN)	--	--	--	--	--	--	--	--	0.4	--
OSF (GN)	--	--	--	--	--	--	--	--	--	--
OSF (TN)	--	--	--	--	--	--	--	--	0.1	--
YEP (GN)	91.3	151.5	19.0	1.5	0.5	--	--	--	--	--
YEP (TN)	8.0	3.3	0.5	--	--	--	--	--	--	--
BLB (GN)	54.7	53.5	89.3	26.0	11.0	--	--	--	--	--
BLB (TN)	170.6	72.2	2,174.7	1,359.5	1,162.7	--	--	--	--	--
BIB (GN)	5.3	--	31.3	--	--	--	--	--	--	--
BIB (TN)	13.2	9.0	3.3	5.5	12.0	--	--	--	--	--
COC (GN)	11.0	0.5	14.7	3.5	6.5	--	--	--	--	--
COC (TN)	5.6	3.9	3.8	3.0	6.9	--	--	--	--	--
SHR (GN)	1.3	--	0.3	--	1.0	--	--	--	--	--
SHR (TN)	4.5	7.2	0.3	--	--	--	--	--	--	--
YEB (GN)	--	--	--	--	--	--	--	--	--	--
YEB (TN)	--	2.4	--	--	4.0	--	--	--	--	--
SPS (GN)	8.0	--	--	--	1.5	--	--	--	--	--
SPS (TN)	--	--	--	--	--	--	--	--	--	--
WHS (GN)	14.3	16.5	12.0	4.0	11.0	--	--	--	--	--
WHS (TN)	2.2	5.0	0.4	3.0	0.6	--	--	--	--	--

CCF (Channel Catfish), STC (Stonecat), NOP (Northern Pike), WAE (Walleye), WHB (White Bass), BLC (Black Crappie), BLG (Bluegill), WHC (White Crappie), GSF (Green Sunfish), OSF (Orange-Spotted Sunfish), YEP (Yellow Perch), BLB (Black Bullhead), BIB (Bigmouth Buffalo), COC (Common Carp), SHR (Shorthead Redhorse), YEB (Yellow Bullhead), SPS (Spottail Shiner), WHS (White Sucker)

MANAGEMENT RECOMMENDATIONS

1. Stock walleye fry or fingerlings as needed to accomplish the management objective.
2. A combination of adult and fingerling stocking, nuisance fish control and habitat improvement is likely needed to accomplish the perch management objective.
3. Reduce nuisance fish populations through a combination of commercial fishing, predator management, and Department removal operations. The construction of an effective fish barrier at the outlet would reduce re-contamination from the Big Sioux River. Reduced nuisance fish populations will help improve water quality, promote the spread of aquatic plants, and decrease competition with desirable fish species.
4. Draft a habitat improvement plan that includes nuisance fish control, watershed management, Christmas tree reefs, shoreline riprap, and fishing piers that protect shoreline areas from wind erosion.

Table 8. Stocking record for Lake Campbell, Brookings County, 1986-2006.

Year	Number	Species	Size
1986	500,000	Northern Pike	Fry
1988	31	Bluegill	Adult
1989	500,000	Northern Pike	Fry
1990	670	Northern Pike	Adult
1991	24,600	Northern Pike	Fingerling
1992	30,000	Northern Pike	Fingerling
	1,000,000	Walleye	Fry
	30,000	Walleye	Sml. Fingerling
	50,150	Yellow Perch	Fingerling
1993	75,000	Walleye	Sml. Fingerling
1994	80,000	Fathead Minnow	Adult
	12,488	Yellow Perch	Lrg. Fingerling
1995	50,000	Channel Catfish	Fingerling
1996	52,920	Channel Catfish	Fingerling
1997	202,300	Walleye	Fingerling
	2,560	Yellow Perch	Adult
1999	100,000	Walleye	Fingerling
	11,131	Yellow Perch	Adult
2001	4,620	Yellow Perch	Juvenile
2004	102,100	Walleye	Fingerling
	21,060	Yellow Perch	Fingerling
2006	926,316	Walleye	Fry

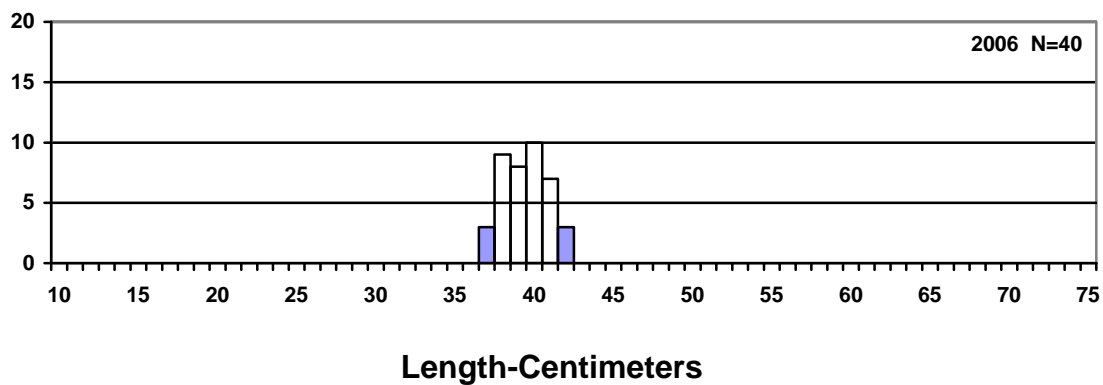


Figure 1. Length-frequency histograms for walleye sampled with gill nets in Lake Campbell, Brookings County, 2006.

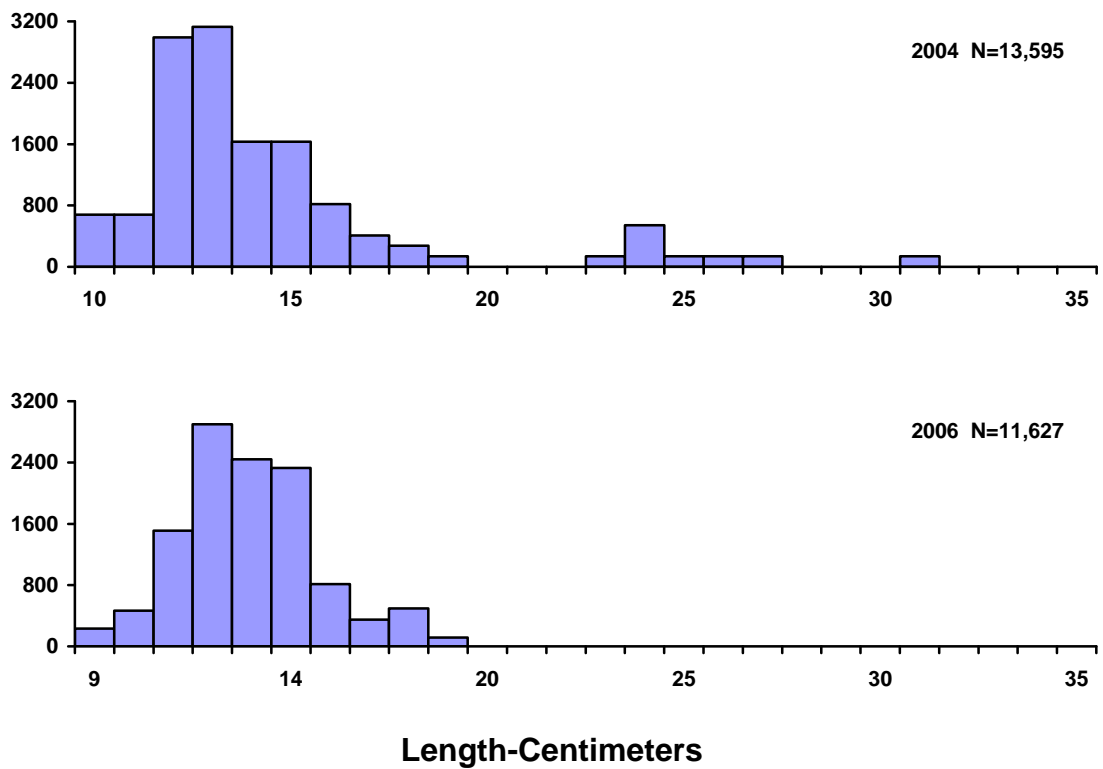


Figure 2. Length-frequency histograms for black bullhead sampled with trap-nets in Lake Campbell, Brookings County, 2004, and 2006.

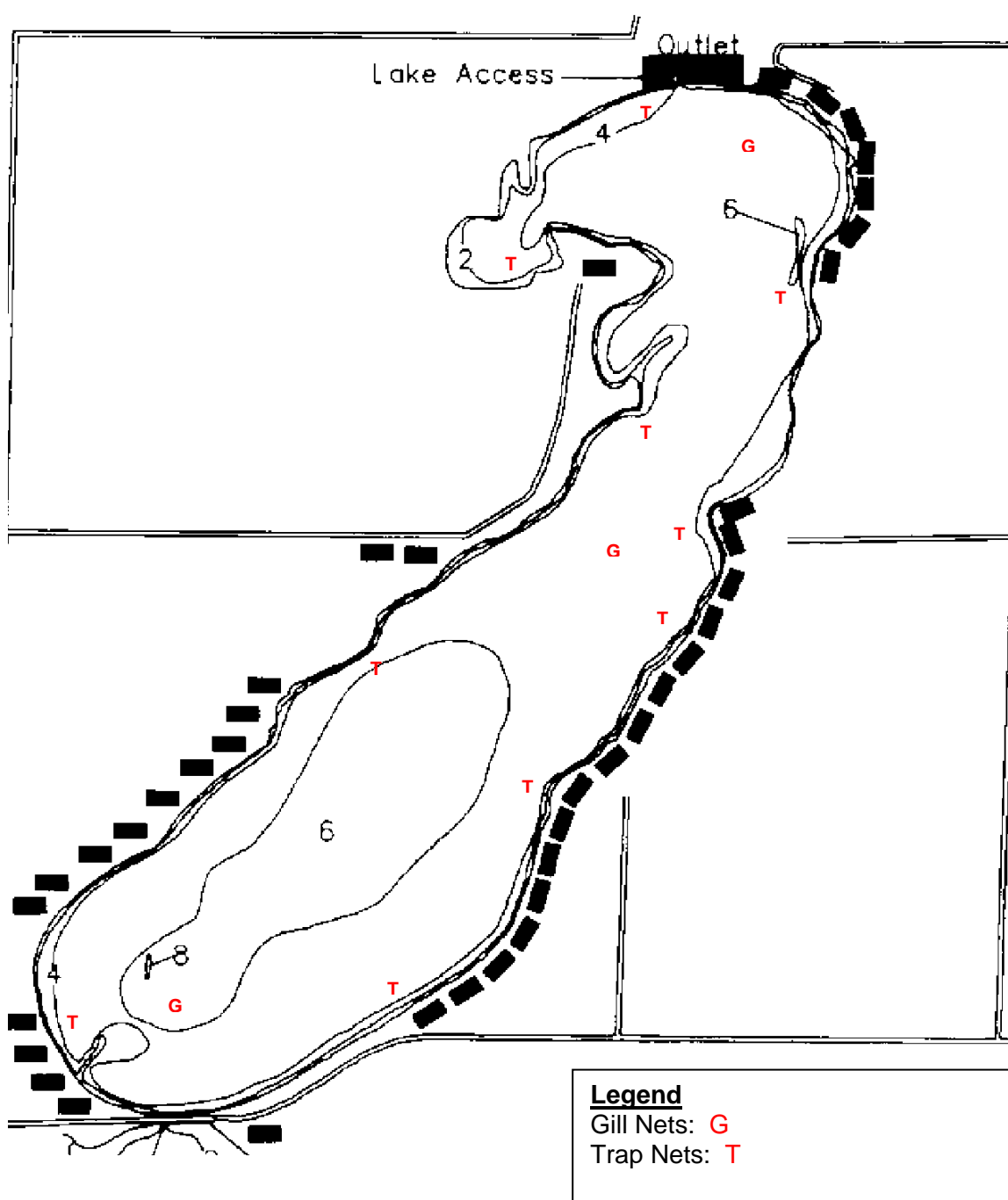


Figure 3. Sampling locations on Lake Campbell, Brookings County, 2006.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-39

Name: East 81 Lake **County:** Brookings
Legal Description: T109N-R52W-Sec. 7, 18
Location from nearest town: 4 miles south of Arlington, SD

Dates of present survey: August 21-23, 2006
Date last surveyed: August 23-25, 2004; September 27, 2004 (electrofishing)

Primary Game and Forage Species	Secondary and Other Species
Yellow Perch	Northern Pike
Walleye	Black Bullhead
	White Bass
	White Sucker
	Yellow Bullhead

PHYSICAL DATA

Surface area: 484 acres **Watershed:** No data available
Maximum depth: Unknown **Mean depth:** Unknown
Volume: Unknown **Shoreline length:** Unknown
Contour map available: Yes **Date mapped:** 2002 (SDSU)
OHWM elevation: None set **Date set:** NA
Outlet elevation: Note set **Date set:** NA
Lake elevation observed during the survey: Three feet low

Ownership of Lake and Adjacent Lakeshore Property

East 81 Lake is not listed as a meandered lake in the State of South Dakota Listing of Meandered Lakes but the South Dakota Department of Game, Fish, and Parks (GFP) manages the fishery. Most of the lake's shoreline lies within a Waterfowl Production Area (WPA) managed by the United States Fish and Wildlife Service (USFWS). The remainder of the shoreline is privately owned.

Fishing Access

There is no boat ramp or facilities located on East 81 Lake. Small boats can be launched off the shoreline in the northwest corner of the lake but parking is limited. There is some shore fishing access within the WPA on the north shore. Because open water access is so poor, most fishing occurs during the winter.

Field Observations of Water Quality and Aquatic Vegetation

The water in East 81 Lake was fairly clear during the survey with a Secchi depth measurement of 183 cm (72 in). Very little algae was observed but sago pondweed (*Potamogeton pectinatus*), northern water milfoil (*Myriophyllum exalbescens*) and clasping leaf pondweed (*Potamogeton richardsonii*) was present around the entire shoreline.

BIOLOGICAL DATA

Methods:

East 81 Lake was sampled on August 21-23, 2006 with three overnight gill net sets and eight overnight trap net sets. The trap nets are constructed with 19-mm-bar-mesh (¾ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh (½, ¾, 1, 1¼, 1½, and 2 in) monofilament netting.

Results and Discussion:

Gill-Net Catch

Walleye comprised 65 % of the gill net sample (Table 1). Other species sampled included yellow perch, white bass, yellow bullhead, white sucker, and northern pike.

Table 1. Total catch from three overnight gill net sets at East 81 Lake, Brookings County, August 21-23, 2006.

Species	Number	Percent	CPUE ¹	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Walleye	106	65.0	35.3	<u>+6.2</u>	3.1	5	0	87
Yellow Perch	43	26.4	14.3	<u>+5.0</u>	123.0	84	30	116
White Bass	9	5.5	3.0	<u>+2.7</u>	1.9	--	--	--
Yellow Bullhead	3	1.8	1.0	<u>+0.7</u>	2.2	--	--	--
White Sucker	1	0.6	0.3	<u>+0.4</u>	0.0	--	--	--
Northern Pike	1	0.6	0.3	<u>+0.4</u>	1.4	--	--	--

* Three years (2000, 2002, 2004).

Trap-Net Catch

Black bullhead was the most common species sampled in trap nets (85.9%). Yellow bullhead, walleye, white sucker, and northern pike were also sampled (Table 2).

¹ See Appendix A for definitions of CPUE, PSD, and mean Wr.

Table 2. Total catch from eight overnight trap net sets at East 81 Lake, Brookings County, August 21-23, 2006.

Species	No.	Percent	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	462	85.9	57.8	± 52.6	972.9	26	2	80
Yellow Bullhead	55	10.2	6.9	± 3.3	59.9	100	95	101
Walleye	18	3.3	2.3	± 1.0	0.3	29	6	86
White Sucker	2	0.4	0.3	± 0.2	0.0	--	--	--
Northern Pike	1	0.2	0.1	± 0.2	1.1	--	--	--

* Three years (2000, 2002, 2004).

Walleye

Management objective: Maintain a walleye fishery with a gill-net CPUE of at least 15, PSD range of 30-60 and a growth rate of 35.4 cm (14 in) in 3 years.

Walleye gill net CPUE increased dramatically this year (Table 3). Age-1 fish dominated the catch (84%) and were most likely produced from the 2005 fingerling stocking (Table 8). Growth is similar to statewide, regional and large lakes means (Table 4). Some of the fingerlings stocked in 2006 had already grown large enough to be sampled by the gill nets during this year's survey (Figure 1).

Table 3. Walleye gill-net CPUE, PSD, RSD-P, and mean Wr for East 81 Lake, Brookings County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE				3.0		2.3		4.0		35.3	3.1
PSD				--		--		--		5	--
RSD-P				--		--		--		0	--
Mean Wr				--		--		--		87	--

*3 years (2000, 2002, 2004)

Table 4. Average back-calculated lengths (mm) for each age class of walleye in East 81 Lake, Brookings County, 2006.

Back-calculation Age										
Year Class	Age	N	1	2	3	4	5	6	7	8
2005	1	89	202							
2004	2	5	183	275						
2003	3	6	147	268	369					
All Classes		100	177	272	369					
Statewide Mean			168	279	360	425	490			
Region III Mean			173	281	367	435	517			
LLI* Mean			169	280	358	425	494			

*Large Lakes and Impoundments (>150 acres)

Yellow Perch

Management objective: Maintain a yellow perch population with a gill-net CPUE of at least 50 with a PSD range of 30-60.

The 2006 gill net catch indicated a continued decline in yellow perch abundance (Table 5). Growth is above average (Table 6) and has improved with the decrease in density since 2002 (Table 5). The length-frequency histograms show a good size distribution with inconsistent natural reproduction (Figure 2). Like other lakes in the region, there has been little natural reproduction since 2001. No perch have ever been stocked in the lake (Table 8).

Table 5. Yellow perch gill-net CPUE, PSD, RSD-P, and mean Wr for East 81 Lake, Brookings County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE				67.5		244.0		57.5		14.3	123.0
PSD				54		46		46		84	49
RSD-P				23		19		20		30	21
Mean Wr				93		105		100		116	99

*3 years (2000, 2002, 2004)

Table 6. Average back-calculated lengths (mm) for each age class of yellow perch in East 81 Lake, Brookings County, 2006.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2005	1	29	129							
2004	2	5	93	214						
2003	3	4	99	202	247					
2002	4	2	100	197	268	292				
2001	5	1	79	161	208	238	255			
2000	6	1	98	147	191	222	263	288		
1999	7	1	119	212	237	268	281	297	311	
All Classes		43	103	189	230	255	266	292	311	
Statewide Mean			86	145	190	220	242			
Region III Mean			94	159	208	242	281			
*LLI Mean			86	146	192	225	249			

*LLI = Large Lakes and Impoundments

Black Bullhead

Management objective: Maintain a black bullhead population with a trap-net net CPUE of less than 100.

Black bullhead trap-net CPUE has declined to 57.8 with a PSD of 26, indicating a low-density population of large fish. Bullheads ranged in length from 15-32 cm (5.9-12.6 in) with a mean of 214 mm (8.4 in) (Figure 3). These fish are nearly large enough to provide sport and commercial fishing. The yellow bullheads were much larger with a mean length of 309 mm (12.2 in), but lower in abundance (CPUE = 6.9).

All Species

Northern pike CPUE is at the lowest point on record (Table 7). CPUE for other species was within previous ranges.

Table 7. Gill-net (GN) and trap-net (TN) CPUE for all fish species sampled in East 81 Lake, Brookings County, 1997-2006.

Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
NOP (GN)				1.0		2.7		0.5		0.3
NOP (TN)				1.0		0.7		1.6		0.1
WAE (GN)				3.0		2.3		4.0		35.3
WAE (TN)				--		0.2		0.7		2.3
WHB (GN)				--		0.7		5.0		3.0
WHB (TN)				--		0.3		0.1		--
YEP (GN)				67.5		244.0		57.5		14.3
YEP (TN)				24.2		4.2		0.1		--
BLB (GN)				168.5		73.7		1.0		--
BLB (TN)				640.0		2,270.8		7.9		57.8
YEB (GN)				--		--		6.5		1.0
YEB (TN)				--		--		179.7		6.9
WHS (GN)				--		0.7		--		0.3
WHS (TN)				--		--		--		0.3

NOP (Northern Pike), WAE (Walleye), WHB (White Bass), YEP (Yellow Perch), BLB (Black Bullhead), YEB (Yellow Bullhead), WHS (White Sucker)

MANAGEMENT RECOMMENDATIONS

1. Stock small walleye fingerlings as needed to accomplish our management objective.
2. Conduct biennial lake surveys to monitor the fishery.
3. Explore opportunities to develop boat and shore fishing access.
4. Complete a contour map of the lake.

Table 8. Stocking record for East 81 Lake, Brookings County, 2003-2006.

Year	Number	Species	Size
2003	440,000	Walleye	Fry
	44,820	Walleye	Fingerlings
2005	50,000	Walleye	Fingerlings
2006	49,170	Walleye	Fingerlings

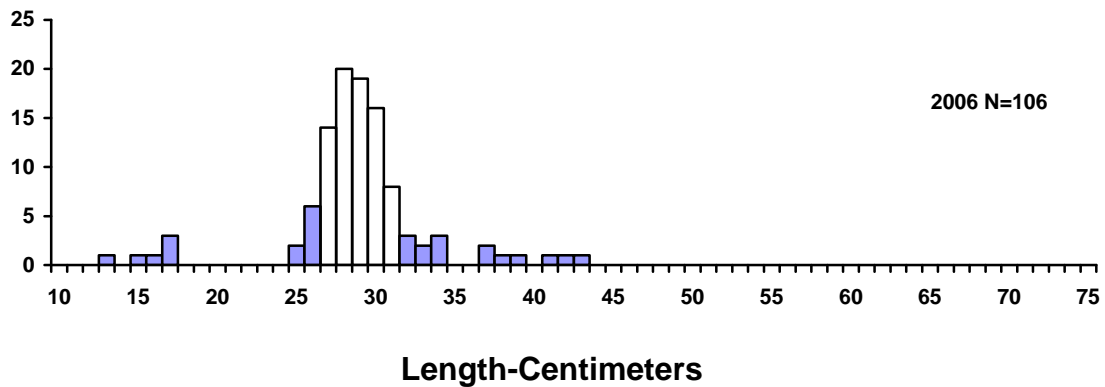


Figure1. Length frequency histogram for walleye from East 81 Lake, Brookings County, 2006.

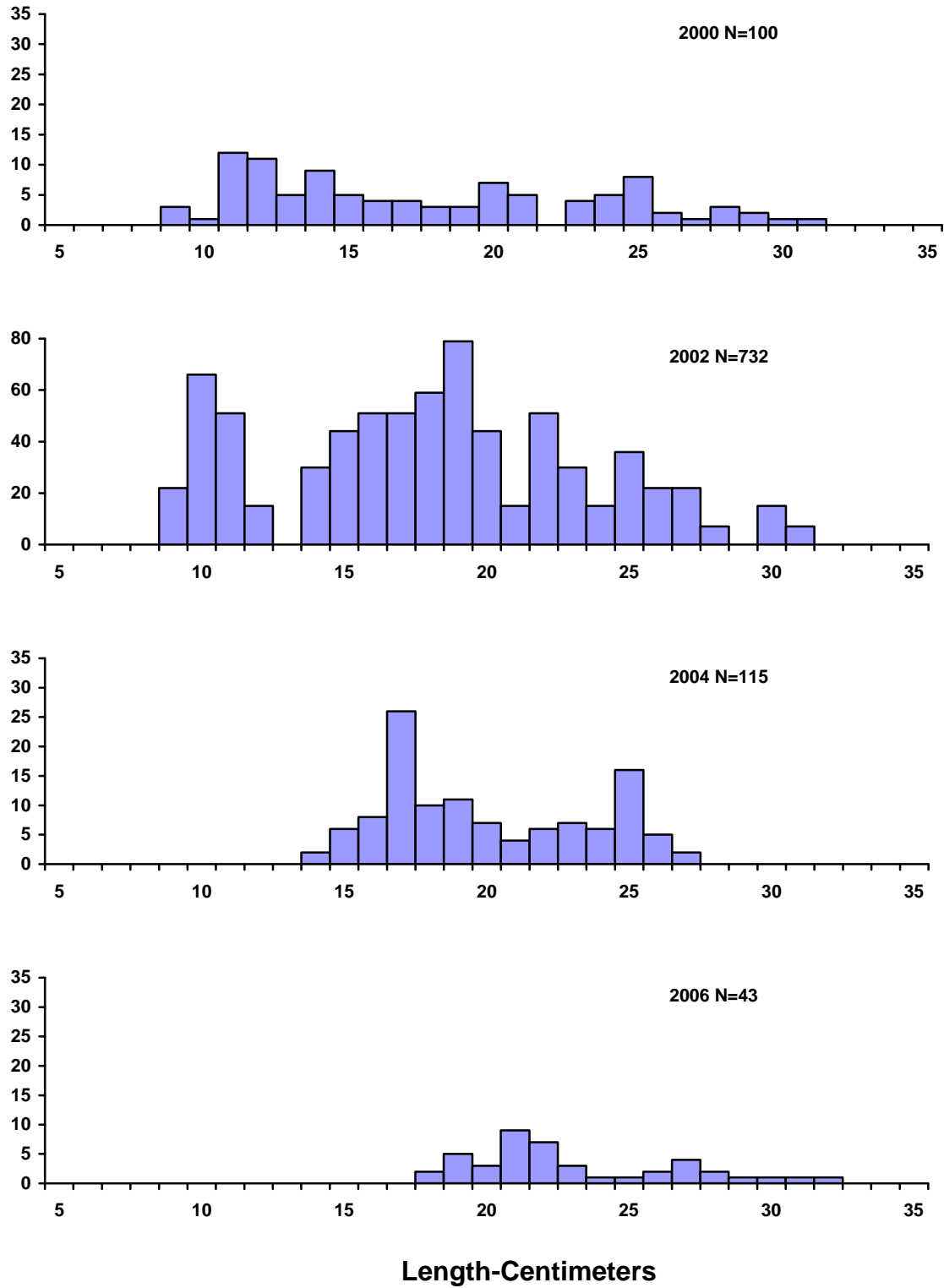
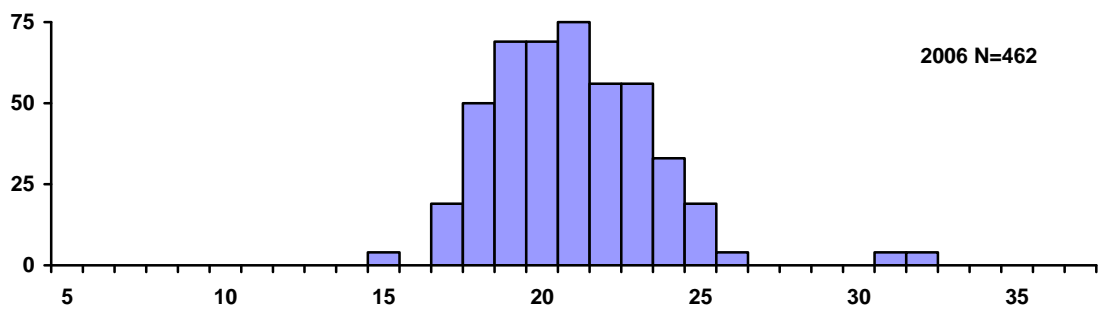
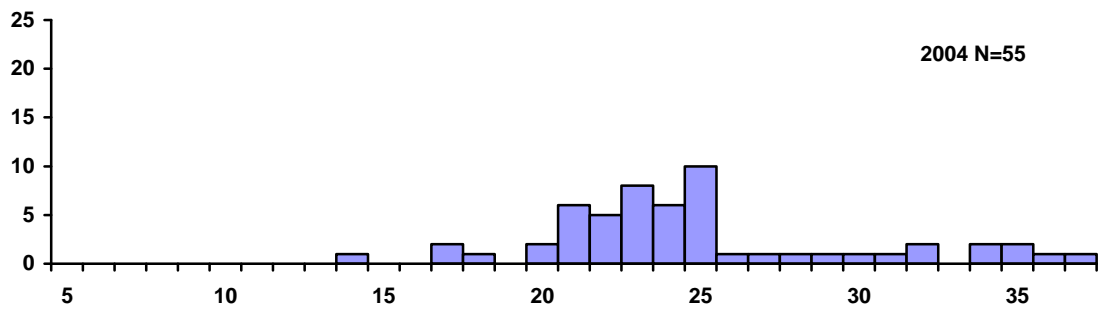
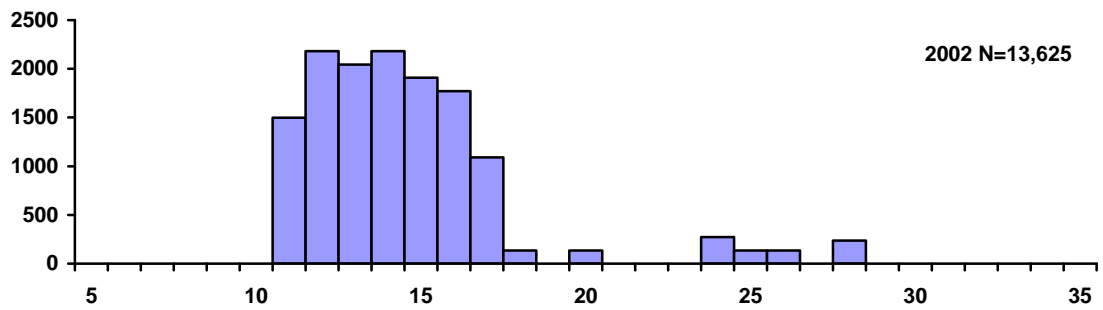
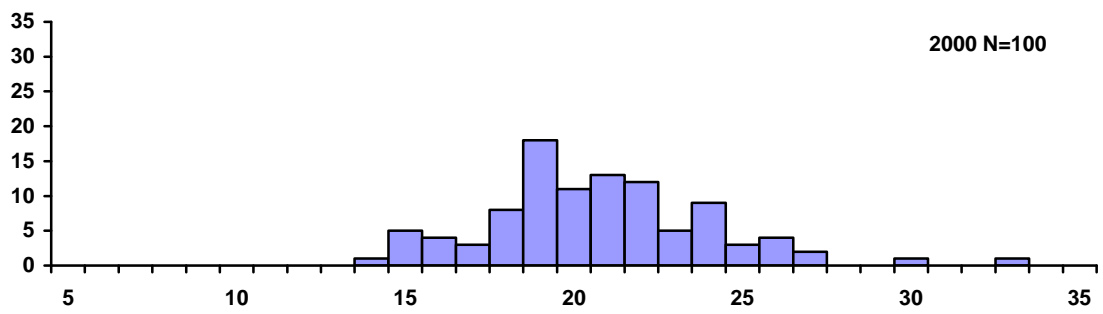


Figure 2. Length frequency histograms for yellow perch sampled with gill nets in East 81 Lake, Brookings County, 2000, 2002, 2004, and 2006.



Length-Centimeters

Figure 3. Length frequency histograms for black bullhead sampled with trap nets in East 81 Lake, Brookings County, 2000, 2002, 2004, and 2006.

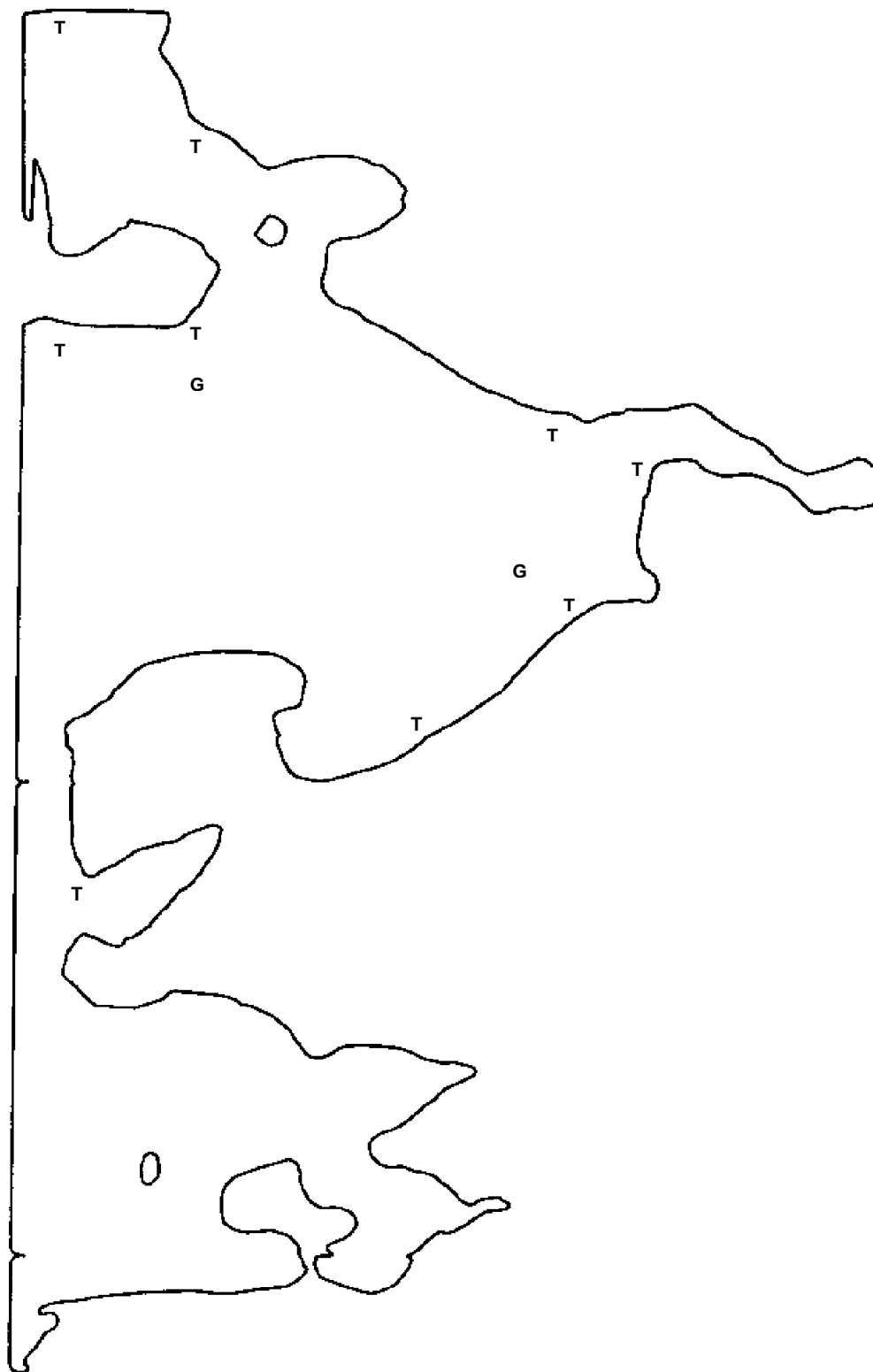


Figure 4. Sampling locations on East 81 Lake, 2006.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-39

Name: East Oakwood Lake **County:** Brookings

Legal Description: T111N- R51W-Sec. 4-5, 8-9, 16-17

Location from nearest town: 3 miles west of Bruce, SD

Dates of present survey: July 31, 2006 - August 2, 2006

Date last surveyed: August 2-5, 2004 (netting); Sept. 16, 2004 (electrofishing)

Primary Game and Forage Species	Secondary and Other Species
Walleye	Northern Pike
Yellow Perch	Common Carp
	Bigmouth Buffalo
	White Sucker
	Black Bullhead
	Tadpole Madtom
	Green Sunfish

PHYSICAL DATA

Surface Area: 928 acres

Maximum depth: 9 feet

Volume: 5000 acre-feet

Contour map available: Yes

OHWM elevation: 1626.9

Outlet elevation: 1626.4

Lake elevation observed during the survey: 6 inches low

Beneficial use classifications: (5) warmwater semipermanent fish propagation, (7) immersion recreation, (8) limited-contact recreation and (9) fish and wildlife propagation and stock watering.

Watershed: 50,999 acres

Mean depth: 5 feet

Shoreline length: 10.7 miles

Date mapped: 1964

Date set: October, 1981

Date set: October, 1981

Introduction

The Oakwood Lakes complex derived its name from the numerous oak trees found in the area. East Oakwood Lake was originally named Oakwood Lake while West Oakwood was originally known as Lake Tetonkaha. East Oakwood is a natural glacial lake with an outlet that flows into the Big Sioux River.

Ownership of Lake and Adjacent Lakeshore Properties

East Oakwood Lake is listed as a meandered lake in the State of South Dakota Listing of Meandered Lakes and the fishery is managed by the South Dakota Department of Game, Fish and Parks (GFP). The north, west, and south shorelines are owned and managed by GFP while the east shoreline is privately owned.

Fishing Access

There is a single lane, concrete plank boat ramp located on the north shore of the lake. Another, barely usable, ramp exists on the south end. A new fishing access area containing a boat ramp, dock and vault toilet is scheduled to be built in 2007 or 2008 on the west shore. Shore fishing opportunities are available on the south shore and at various locations on the north and west shores.

Field Observations of Water Quality and Aquatic Vegetation

The Secchi depth measurement during the survey was only 18 cm (7 in) due to a dense algae bloom. No submerged vegetation was observed anywhere in the lake. Common cattail was present in the western bays.

BIOLOGICAL DATA

Methods:

East Oakwood Lake was sampled on July 31, 2006 - August 2, 2006 with two overnight gill net sets and 10 overnight trap net sets. The trap nets are constructed with 19-mm-bar-mesh ($\frac{3}{4}$ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh ($\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, and 2 in) monofilament netting. Sampling locations are displayed in Figure 4.

Results and Discussion:

Gill Net Catch

Walleye (53.3%), yellow perch (33.5%), and black bullhead (6.9%) were the most common species sampled in the gill nets (Table 1). Orange-spotted sunfish, common carp, white sucker, and northern pike were also sampled.

Table 1. Total catch from two overnight gill net sets at East Oakwood Lake, Brookings County, July 31, 2006 - August 2, 2006.

Species	Number	Percent	CPUE ¹	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Walleye	278	53.3	139.0	± 152.5	18.8	100	12	91
Yellow Perch	175	33.5	87.5	± 57.0	56.5	3	0	94
Black Bullhead	36	6.9	18.0	± 5.1	29.0	0	0	114
O.S. Sunfish	17	3.3	8.5	± 10.9	0.6	--	--	--
Common Carp	12	6.0	5.7	± 5.1	19.0	--	--	--
White Sucker	3	0.6	1.5	± 0.6	2.0	--	--	--
Northern Pike	1	0.2	0.5	± 0.6	1.4	--	--	--

* 6 years (1994, 1996, 1998, 2000, 2002, 2004)

¹ See Appendix A for definitions of CPUE, PSD, and mean Wr.

Trap Net Catch

Black bullhead (41.7%), walleye (29.0%), white sucker (13.0%), and yellow perch (9.1%) were the most abundant species in the trap-net sample (Table 2). East Oakwood is one of the few lakes where we sample tadpole madtoms. Other species sampled included orange-spotted sunfish, common carp, northern pike bigmouth buffalo, green sunfish and yellow bullhead. Only six walleyes greater than stock length of 25 cm (10 in) were sampled with trap nets so PSD and RSD-P were not calculated.

Table 2. Total catch from nine overnight trap net sets at East Oakwood Lake, Brookings County, July 31, 2006 - August 2, 2006.

Species	Number	Percent	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	672	41.7	67.2	<u>+35.3</u>	177.6	2	0	105
Walleye	467	29.0	46.7	<u>+13.0</u>	2.7	--	--	110
White Sucker	209	13.0	20.9	<u>+5.4</u>	9.0	6	6	95
Yellow Perch	147	9.1	14.7	<u>+4.8</u>	15.5	8	0	95
O.S. Sunfish	49	3.0	4.9	<u>+3.3</u>	0.0	--	--	--
Tadpole Madtom	25	1.6	2.5	<u>+1.3</u>	1.5	--	--	--
Common Carp	24	1.5	2.4	<u>+0.5</u>	31.7	93	93	93
Northern Pike	10	0.6	1.0	<u>+0.6</u>	1.2	--	--	--
Bigmouth Buffalo	5	0.3	0.5	<u>+0.3</u>	2.7	--	--	--
Green Sunfish	1	0.1	0.1	<u>+0.1</u>	0.1	--	--	--
Yellow Bullhead	1	0.1	0.1	<u>+0.1</u>	0.0	--	--	--

* 8 years (1991, 1992, 1994, 1996, 1998, 2000, 2002, 2004)

Walleye

Management objective: Maintain a walleye fishery with a gill-net CPUE of at least 15, PSD range of 30-60 and a growth rate of 35.4 cm (14 in) in 3 years.

Age-0 walleyes comprised 93.8% of the 2006 gill-net CPUE (Table 3). These fish likely originated from the 2006 fry stocking because East Oakwood has a history of poor natural production and past stockings have been very successful (Table 9). The remaining walleyes sampled were from the 2004 and 2001 year classes (Table 4) also stocked years (Table 9). Walleye growth in West Oakwood exceeds statewide, regional and large lakes means (Table 9).

Table 3. Walleye gill-net CPUE, PSD, RSD-P, and mean Wr for East Oakwood Lake, Brookings County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CPUE		23.5		12.0		6.3		67.0		139.0
PSD		0		88		0		100		100
RSD-P		0		8		0		0		12
Mean Wr		93		78		99		103		91

Table 4. Average back-calculated lengths (mm) for each age class of walleye in East Oakwood Lake, Brookings County, 2006.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2006	0	261								
2004	2	15	208	404						
2001	5	2	226	389	474	517	530			
All Classes		278	217	397	474	517	530			
Statewide Mean			168	279	360	425	490			
Region III Mean			173	281	367	435	517			
LLI Mean			169	280	358	425	494			

Yellow Perch

Management objective: Maintain a yellow perch population with a gill-net CPUE of at least 50 with a PSD range of 30-60.

Yellow perch gill-net CPUE increased this year (Table 5) and the sample was mainly comprised of 14-21 cm (5.5-8.3 in) long yearling fish (Figure 2). Growth is similar to statewide, regional, and large lakes means (Table 6).

Table 5. Yellow perch gill-net CPUE, PSD, RSD-P, and mean Wr for East Oakwood Lake, Brookings County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CPUE		96.0		32.0		66.0		14.3		87.5
PSD		39		81		17		79		3
RSD-P		1		6		1		67		0
Mean Wr		97		101		108		102		94

Table 6. Average back-calculated lengths (mm) for each age class of yellow perch in East Oakwood Lake, Brookings County, 2006.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2005	1	169	99							
2004	2	6	100	157						
All Classes		175	99	157						
Statewide Mean			86	145	190	220	242			
Region III Mean			94	159	208	242	281			
LLI Mean			86	146	192	225	249			

Black Bullhead

Management objective: Maintain a black bullhead population with a trap-net net CPUE of less than 100.

Black bullhead trap-net CPUE decreased dramatically since 2002, probably due to poor recruitment. A mean length of 162 mm (6.4 in) (Figure 3) and PSD of only 2 indicates a population comprised of small fish.

Table 7. Black bullhead trap-net CPUE and PSD for West Oakwood Lake, Brookings County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CPUE		28.2		432.7		545.8		7.9		67.2
PSD		40		0		5		3		2
RSD-P		--		--		--		3		0
Mean Wr		--		--		--		82		105

All Species

The fish community in East Oakwood Lake appears to be in good shape (Table 8). The black bullhead population is low and rough fish abundance is not a concern. Yellow perch abundance is increasing.

Table 8. Gill-net (GN) and trap-net (TN) CPUE for all fish species sampled in East Oakwood Lake, Brookings County, 1997-2006.

Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
NOP (GN)		2.0		0.7		1.0		1.7		0.5
NOP (TN)		1.8		2.2		0.4		0.3		1.0
WAE (GN)		23.5		12.0		6.3		67.0		139.0
WAE (TN)		14.0		3.1		0.9		1.3		46.7
GSF (GN)		--		--		--		--		--
GSF (TN)		--		--		0.3		0.3		0.1
OSF (GN)		--		--		--		1.3		8.5
OSF (TN)		--		--		--		0.3		4.9
YEP (GN)		96.0		32.0		66.0		14.3		87.5
YEP (TN)		41.4		4.1		2.1		1.9		14.7
BLB (GN)		4.0		141.3		21.0		4.7		18.0
BLB (TN)		28.2		432.7		545.8		7.9		67.2
YEB (GN)		--		--		--		--		--
YEB (TN)		--		--		--		--		0.1
TMT (GN)		--		--		--		--		--
TMT (TN)		0.8		--		7.7		2.7		2.5
BIB (GN)		0.5		3.3		0.7		6.3		--
BIB (TN)		4.4		4.5		1.6		1.9		0.5
COC (GN)		28.0		2.3		48.0		0.3		6.0
COC (TN)		75.3		5.7		51.4		10.4		2.4
COS (GN)		--		--		0.3		--		--
COS (TN)		--		--		--		--		--
WHS (GN)		2.5		4.0		0.7		1.3		1.5
WHS (TN)		23.2		4.1		22.6		11.2		20.9

NOP (Northern Pike), WAE (Walleye), GSF (Green Sunfish), OSF (Orange-spotted Sunfish), YEP (Yellow Perch), BLB (Black Bullhead), YEB (Yellow Bullhead), TMT (Tadpole Madtom), BIB (Bigmouth Buffalo), COC (Common Carp), COS (Common Shiner), WHS (White Sucker)

MANAGEMENT RECOMMENDATIONS

1. Stock walleye fry (1,000/acre) or walleye fingerlings (100/acre) as needed to meet management objectives
2. Stock pre-spawn adult yellow perch following a winterkill or into an existing population at the rate of 10/acre as needed to meet management objectives
3. Encourage commercial fishing for common carp, bigmouth buffalo and black bullheads.

Table 9. Stocking record for East Oakwood Lake, Brookings County, 1991-2006.

Year	Number	Species	Size
1991	27,780	Yellow Perch	Fingerling
	7,330	Walleye	Lrg. Fingerling
	4,176	Walleye	Sml. Fingerling
	209	Walleye	Adult
1992	300,000	Northern Pike	Fry
	30,000	Northern Pike	Fingerling
	51,850	Yellow Perch	Fingerling
1994	36,610	Yellow Perch	Lrg. Fingerling
	8,620	Yellow Perch	Adult
1995	41,000	Fathead Minnow	Adult
	135,000	Walleye	Sml. Fingerling
1996	2,707,000	Walleye	Fry
	136,840	Yellow Perch	Fingerling
1997	1,000,000	Walleye	Fry
1999	1,000,000	Walleye	Fry
2001	100,000	Walleye	Fingerling
	10,159	Yellow Perch	Adult
2004	100,700	Walleye	Fingerling
2006	1,001,580	Walleye	Fry

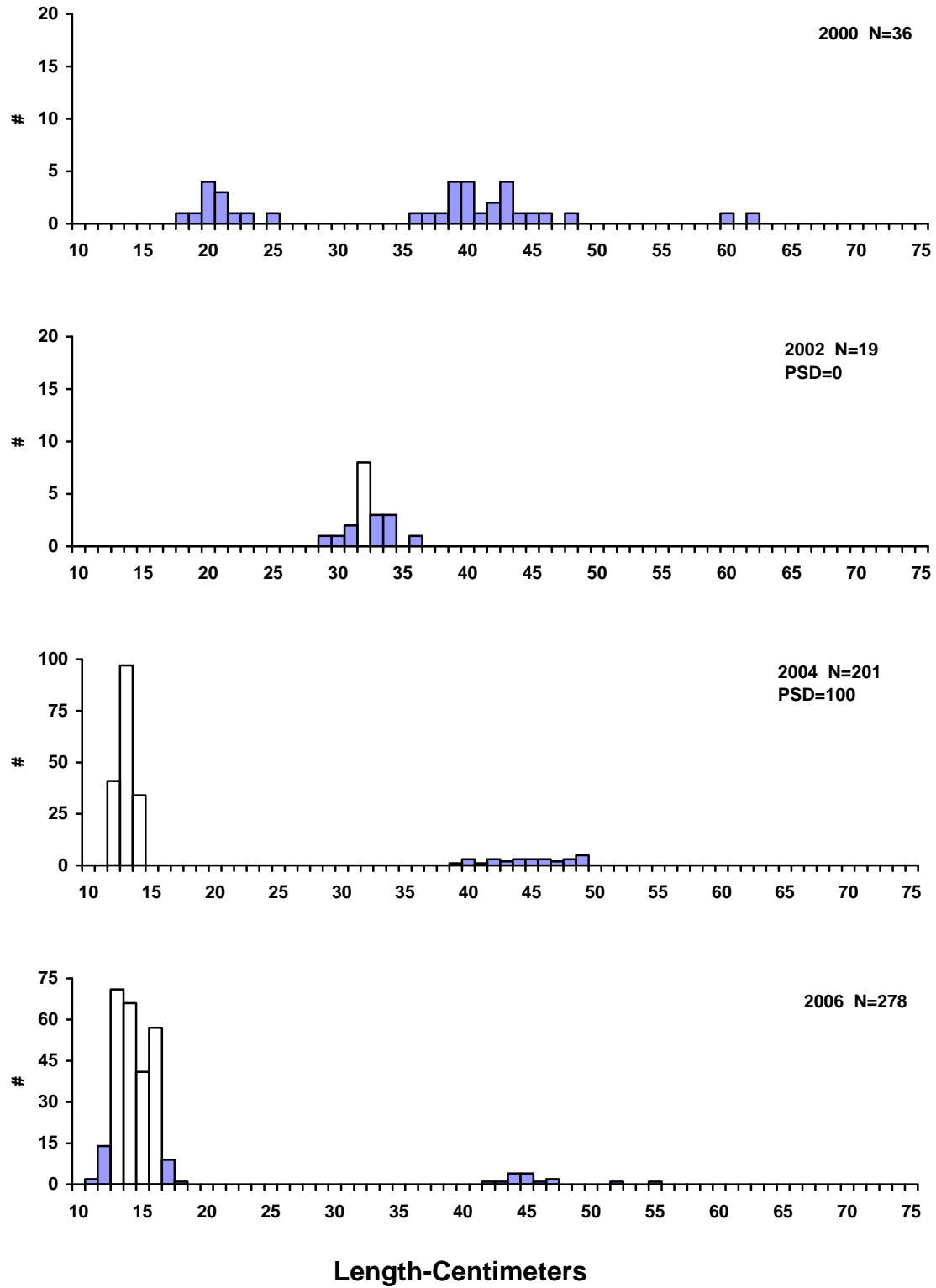


Figure 1. Length frequency histograms for walleye sampled with gill nets in East Oakwood Lake, Brookings County, 2000, 2002, 2004, and 2006.

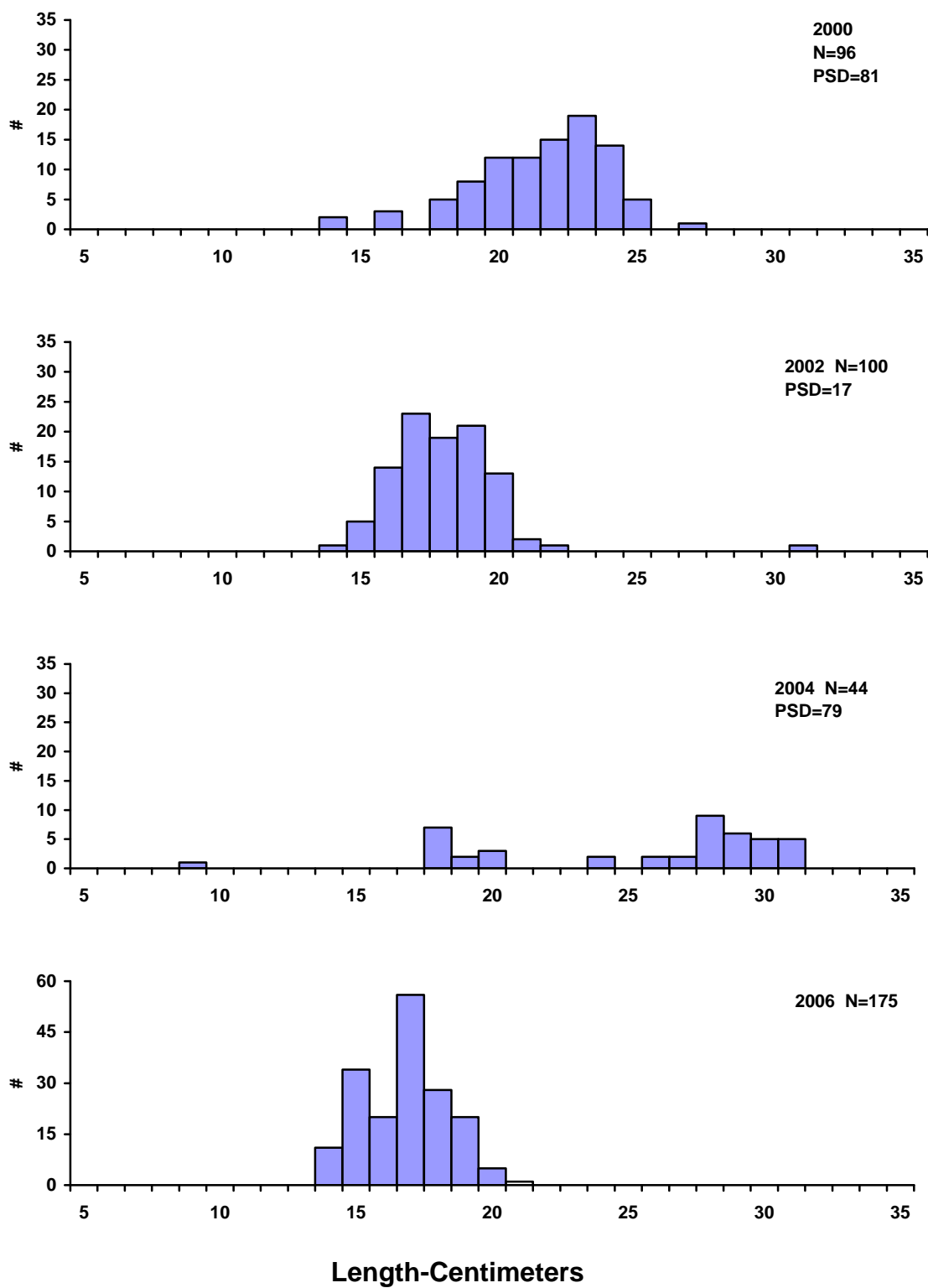


Figure 2. Length frequency histograms for yellow perch sampled with gill nets in East Oakwood Lake, Brookings County, 2000, 2002, 2004, and 2006.

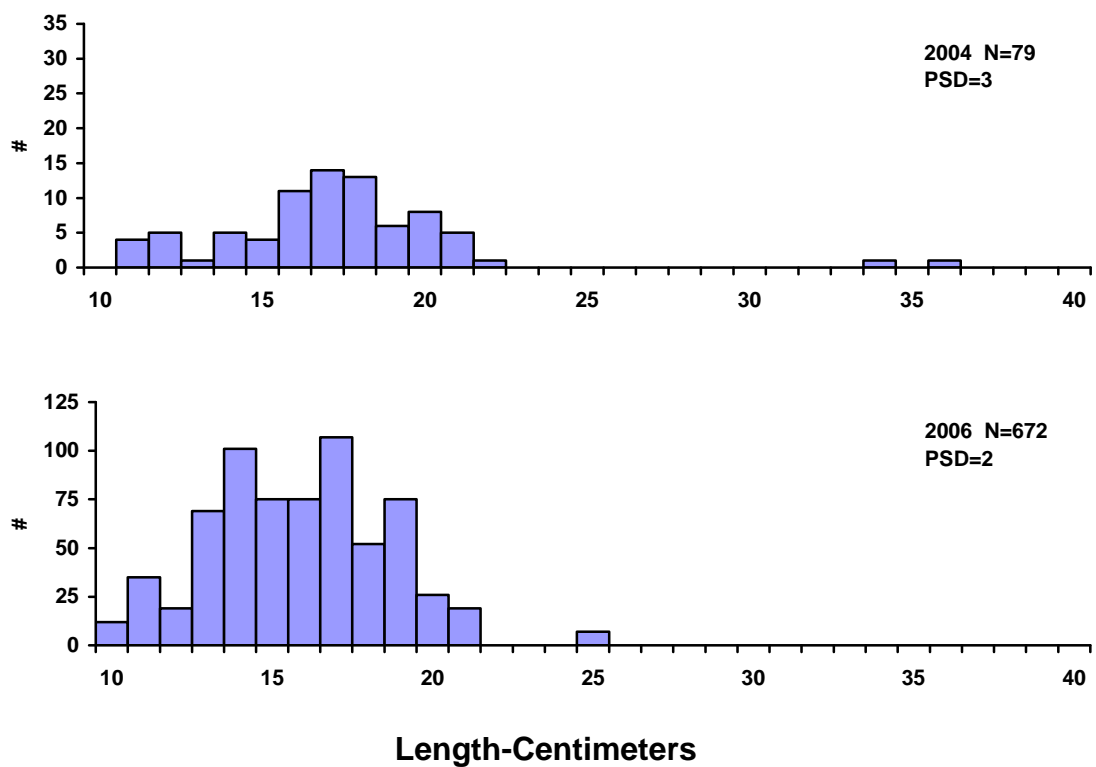


Figure 3. Length frequency histograms for black bullhead sampled with trap nets in East Oakwood Lake, Brookings County, 2004 and 2006.

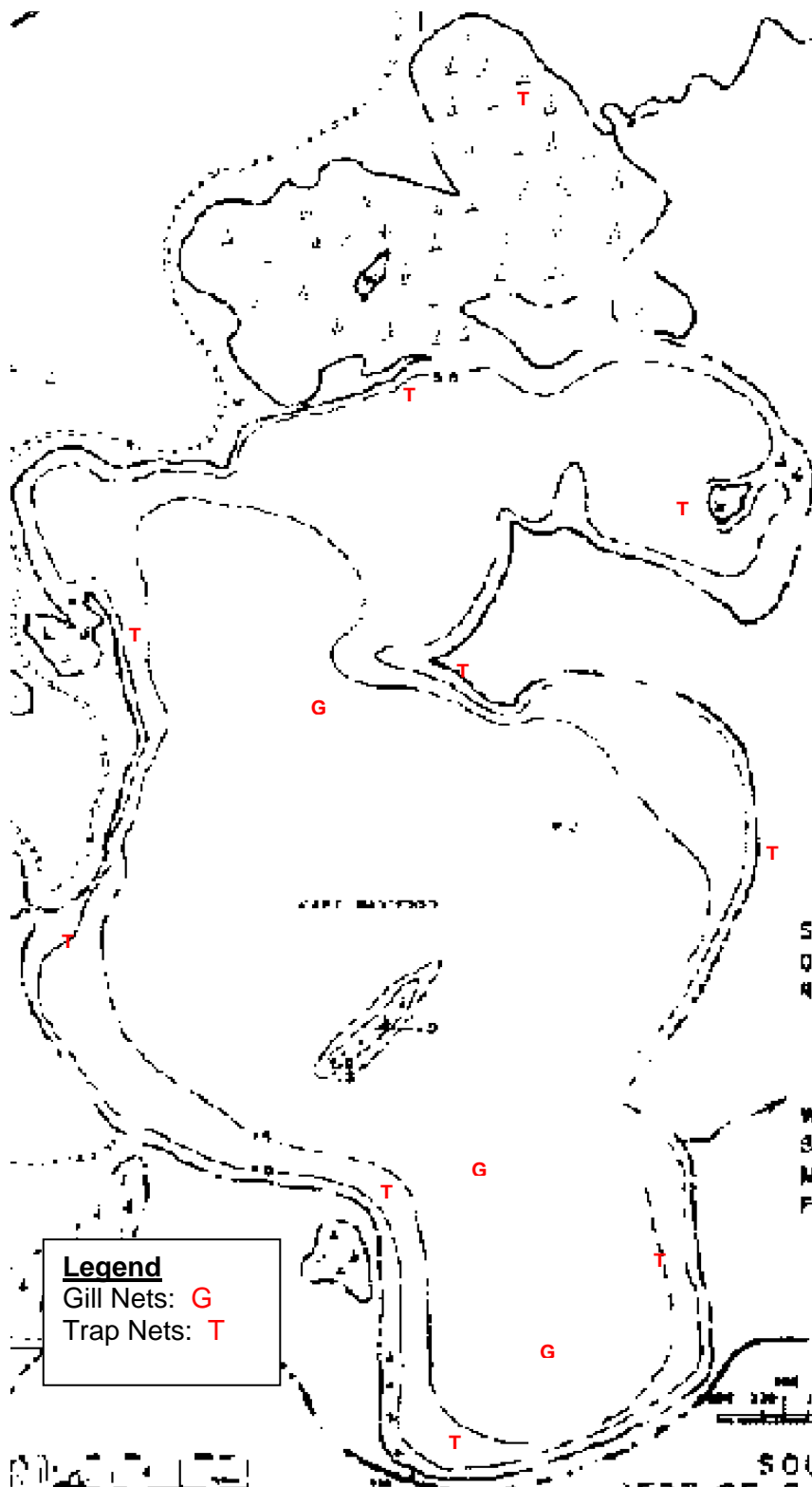


Figure 4. Sampling locations on East Oakwood, Brookings County, 2006.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-39

Name: Lake Sinai

County: Brookings

Legal Description: T109N- R52W-Sec 3-4, 9-10

Location from nearest town: 1 mile west, 1½ mile north of Sinai, SD

Dates of present survey: June 28-30, 2006 (netting); September 25, 2006 (electrofishing)

Dates of last survey: July 5-7, 2005 (netting); September 15, 2005 (electrofishing)

Primary Game Species	Other Species
Walleye	Black Bullhead
Yellow Perch	Common Carp
Smallmouth Bass	Northern Pike
	Bluegill
	Green Sunfish
	Hybrid Sunfish
	Black Crappie

PHYSICAL DATA

Surface area: 1,719 acres

Maximum depth: 33 feet

Volume: No data

Contour map available: Yes

OHWM elevation: None set

Outlet elevation: None set

Lake elevation observed during the survey: 1.6 feet low

Beneficial use classifications: (4) warmwater permanent fish propagation, (7) immersion recreation, (8) limited-contact recreation and (9) fish and wildlife propagation and stock watering.

Watershed area: No data

Mean depth: 17 feet

Shoreline length: No data

Date mapped: 2002

Date set: NA

Date set: NA

Introduction

Lake Sinai is a natural glacial lake located just northwest of the town of Sinai in west central Brookings County. It was named by county commissioners because they felt the surrounding land resembled the land around Mount Sinai in the Holy Land. Heavy precipitation in the late 1980s doubled the size of the lake.

Ownership of Lake and Adjacent Lakeshore Properties

Lake Sinai is listed as meandered public water in the State of South Dakota Listing of Meandered Lakes and the South Dakota Department of Game, Fish, and Parks (GFP) manages the fishery. GFP also owns and manages Game Production Areas and Lake Access Areas on the north, south, and east sides of the lake. The remainder of the shoreline is privately owned.

Fishing Access

The North Lake Access Area has a double lane boat ramp with a dock, a large parking area, and a public toilet. There is limited shore fishing access. The East Lake Access Area is flooded and unusable.

Field Observations of Water Quality and Aquatic Vegetation

Water clarity was excellent with a Secchi depth measurement of 3 m (118 in). Some suspended algae, beds of sago pondweed (*Potamogeton pectinatus*) and a small amount of clasping leaved pondweed (*Potamogeton richardsonii*) was observed around the lake and there are still considerable areas of flooded trees and brush.

BIOLOGICAL DATA

Methods:

Lake Sinai was sampled on June 28-30, 2006 with six overnight gill-net sets and ten overnight trap-net sets. The trap nets are constructed with 19-mm-bar-mesh ($\frac{3}{4}$ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh ($\frac{1}{2}$, $\frac{3}{4}$, 1, 1 $\frac{1}{4}$, 1 $\frac{1}{2}$, and 2 in) monofilament netting. Two hours of nighttime electrofishing were done on September 25, 2006 to evaluate walleye recruitment. Sampling sites are displayed in Figure 5.

Results and Discussion:

Gill Net Catch

Yellow perch (76.4%) were the most common species sampled in the gill nets this year followed by walleye, common carp, northern pike, smallmouth bass, black bullhead and black crappie (Table 1).

Table 1. Total catch from six overnight gill net sets at Lake Sinai, Brookings County, June 28-30, 2006.

Species	No.	%	CPUE ¹	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Yellow Perch	168	76.4	28.0	± 5.3	66.2	76	23	98
Walleye	37	16.8	6.2	± 2.1	17.0	46	14	86
Common Carp	7	3.2	1.2	± 1.0	1.7	--	--	--
Northern Pike	5	2.3	0.8	± 0.4	1.5	--	--	--
Smallmouth Bass	1	0.5	0.2	± 0.2	0.0	--	--	--
Black Bullhead	1	0.5	0.2	± 0.2	55.5	--	--	--
Black Crappie	1	0.5	0.2	± 0.2	0.0	--	--	--

*10 years (1996-2005)

¹ See Appendix A for definitions of CPUE, PSD, RSD-P, and mean Wr.

Trap Net Catch

Black bullhead (25.3%), smallmouth bass (20.2%), yellow perch (18.2%) and walleye (18.2%) were the most abundant species in the trap net sample (Table 2). Other species sampled included black crappie, bluegill, and common carp. The total number of fish captured in the trap nets was low (Table 2).

Table 2. Total catch from ten overnight trap net sets at Lake Sinai, Brookings County, June 28-30, 2006.

Species	No.	%	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	25	25.3	2.5	±1.1	173.3	100	92	94
Smallmouth Bass	20	20.2	2.0	±0.9	0.3	11	0	102
Yellow Perch	18	18.2	1.8	±0.7	14.6	50	11	94
Walleye	18	18.2	1.8	±0.9	1.0	33	11	79
Black Crappie	9	9.1	0.9	±0.9	0.0	--	--	--
Bluegill	8	8.1	0.8	±0.6	0.3	--	--	--
Common Carp	1	1.0	0.1	±0.1	2.5	--	--	--

*4 years (2002-2005)

Walleye

Management objective: Maintain a walleye population with a gill-net CPUE of at least 20, a PSD range of 30-60, and a growth rate of 14 inches by age-3.

Although walleye gill-net CPUE increased slightly, it is still well below our management objective (Table 3). Fish from the 2004 year class comprised the majority of the sample (Table 4) (Figure 1).

Walleye growth was faster than regional, statewide and large lakes means with fish reaching 356 mm (14 in) before age-3 (Table 4). Walleye Wr consistently runs from the mid to upper 80's. However, when a large year class of yellow perch was produced in 2001, walleye condition jumped to the upper 90's (Table 3).

Table 3. Walleye gill-net CPUE, PSD, RSD-P, and mean Wr in Lake Sinai, Brookings County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	5.5	11.2	17.4	18.3	32.7	30.7	14.8	6.0	5.8	6.2	17.0
PSD	--	14	25	67	2	62	71	64	48	46	43
RSD-P	--	5	0	17	0	1	7	18	10	14	7
Mean Wr	81	85	85	84	98	98	84	84	87	86	88

*10 years (1996-2005)

Table 4. Average back-calculated lengths (mm) for each age class of walleye in Lake Sinai, Brookings County, 2006.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2004	2	20	140	259						
2003	3	4	195	295	374					
2002	4	5	178	284	347	406				
2001	5	2	209	331	391	443	471			
2000	6	2	189	307	400	473	518	545		
1999	7	1	163	272	416	494	516	548	579	
1998	8	3	211	327	428	492	560	611	635	647
All Classes		37	164	279	383	449	522	579	621	647
Statewide Mean			168	279	360	425	490			
Region III Mean			173	281	367	435	517			
LLI Mean*			169	280	358	425	494			

*Large Lakes and Impoundments (>150 acres)

Walleye fingerlings marked with oxytetracycline (OTC) were stocked in 2006 (Table 13). Fall electrofishing indicated a strong year class was produced (Table 5) and 96% of the fish sampled had OTC marks. Age-0 walleyes were relatively large and in good condition for such a large year class. No yearlings from the weak 2005 year class were sampled.

Table 5. Age-0 and age-1 walleyes sampled during 2 hours of nighttime electrofishing on Lake Sinai, Brookings County, 2000-2006.

Year	Stocking	Age-0 CPH	80% C.I.	% stocked	Mean length (range; mm)	Wr	Age-1 CPH	80% C.I.	Mean length (range; mm)	Wr
2006	fingerling	291	199-393	96	175 (149-221)	85	0	--	--	--
2005	none	9	5-13		194 (163-212)	90	64	42-84	251 (223-294)	81
2004	fingerling	87	35-139	¹	134 (110-160)	95	4	1-6	294 (270-314)	90
2003	none	19	12-26		209 (198-223)	101	22	18-26	317 (274-354)	87
2002	none	122	102-141		180 (147-206)	97	12	4-21	282 (200-315)	90
2001	none	59	36-81		169 (138-222)	105	6	3-9	324 (311-339)	97
2000	none	5	2-8		162 (152-174)	80	1	0-2	195	67

¹ Oxymerine killed immersed fingerlings so no marking of stocked fish was done.

Yellow Perch

Management objective: Maintain a yellow perch population with a gill-net CPUE of at least 50 with a PSD range of 30-60.

Yellow perch gill-net CPUE continues to decline well below the management objective (Table 6). The perch sampled ranged in length from 12-29 cm (4.7-11.4 in) and were 1-6 years old (Figure 2 and Table 7). In contrast to other large lakes (i.e. Madison, Thompson and Brant), Sinai has had some perch reproduction since 2001. Over 20% of the perch sampled are from the 2001 year-class and are responsible for the high PSD and RSD-P values (Table 6). Growth is faster than average for large lakes and impoundments (LLI mean, Table 7) with fish reaching 20 cm (8 in) at age-3.

Table 6. Yellow perch gill-net CPUE, PSD, RSD-P and mean Wr in Lake Sinai, Brookings County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	39.5	40.0	37.4	82.0	40.2	127.7	77.3	65.0	40.8	28.0	66.2
PSD	15	79	33	59	94	70	24	82	85	76	55
RSD-P	3	4	8	10	10	26	1	0	28	23	10
Mean Wr	102	100	105	108	97	111	94	99	107	98	101

*10 years (1996-2005)

Table 7. Average back-calculated lengths (mm) for each age class of yellow perch in Lake Sinai, Brookings County, 2006.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2005	1	24	102							
2004	2	83	81	190						
2003	3	20	84	153	208					
2002	4	5	92	200	237	256				
2001	5	35	67	152	212	242	260			
2000	6	2	72	171	239	255	273	287		
All Classes		169	82	176	214	244	261	287		
Statewide Mean			86	145	190	220				
Region III Mean			94	159	208	242				
LLI Mean			86	146	192	225				

Black Bullhead

Management objective: Maintain a black bullhead population with a trap net CPUE of less than 100.

Bullhead abundance has declined continuously since 2001 (Table 8). The majority of bullheads sampled were over 30 cm (12 in) long (Figure 3). The length-frequency histograms (Figure 3) show black bullhead year classes moving through the population and then diminishing when they approach 30 cm (12 in) in length at age-4. There has been no recent recruitment. Based on length frequencies, growth appears to be extremely good, with fish reaching a quality length of 23 cm (9 in.) at just over age-2.

Table 8. Black bullhead gill-net CPUE, PSD, RSD-P and mean Wr in Lake Sinai, Brookings County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	85.0	67.0	108.2	134.7	39.8	49.5	32.3	5.3	0.2	0.2	55.5
PSD	3	100	44	31	100	29	3	57	--	--	46
RSD-P	0	0	15	1	6	7	2	14	--	--	6
Mean Wr	--	93	101	105	97	123	94	84	--	--	100

*10 years (1996-2005)

Table 9. Black bullhead trap-net CPUE, PSD, RSD-P, mean Wr and mean length in Lake Sinai, Brookings County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE						634.0	45.5	9.9	3.9	2.5	173.3
PSD						56	29	95	100	100	70
RSD-P						35	15	74	77	92	50
Mean Wr						92	90	93	97	94	93
Mean Length mm						191	227	310	326	343	243

*4 years (2002-2005)

All Species

Lake Sinai is a large, deep natural lake with diverse habitat, yet we have sampled only ten different species of fish in the last ten years of netting surveys (Table 10), and only eight in 2006. Recently introduced smallmouth bass have been sampled in gill nets and trap net catches and are increasing. Black crappies were sampled for the first time during the 2006 survey.

Table 10. Gill-net (GN) and trap-net (TN) CPUE for all fish species sampled in Lake Sinai, Brookings County, 1997-2006.

Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
NOP (GN)	4.0	1.3	2.4	--	1.7	0.5	1.5	0.3	0.7	0.8
NOP (TN)	0.1	*	*	*	*	--	0.1	0.1	0.4	--
WAE (GN)	5.5	11.2	17.4	18.3	32.7	30.7	14.8	6.0	5.8	6.2
WAE (TN)	1.5	*	*	*	*	0.5	1.4	0.8	1.1	1.8
BLG (GN)	--	--	--	--	--	--	--	--	--	--
BLG (TN)	0.1	*	*	*	*	0.4	0.2	0.2	0.2	0.8
BLC (GN)	--	--	--	--	--	--	--	--	--	0.2
BLC (TN)	--	--	--	--	--	--	--	--	--	0.9
SMB (GN)	--	--	--	--	--	--	--	--	0.3	0.2
SMB (TN)	--	--	--	--	--	--	--	0.2	0.9	2.0
GSF (GN)	--	--	--	--	--	--	--	--	--	--
GSF (TN)	0.1	*	*	*	*	1.1	--	--	0.1	--
HYB (GN)	--	--	--	--	--	--	--	--	--	--
HYB (TN)	--	*	*	*	*	0.4	0.1	0.1	--	--
YEP (GN)	39.5	40.0	37.4	82.0	40.2	127.7	77.3	65.0	40.8	28.0
YEP (TN)	0.8	*	*	*	*	42.8	6.6	2.6	6.4	1.8
BLB (GN)	85.0	67.0	108.2	134.7	39.8	49.5	32.3	5.3	0.2	0.2
BLB (TN)	190.4	*	*	*	*	634.0	45.5	9.9	3.9	2.5
COC (GN)	--	0.5	--	--	--	5.2	3.0	4.8	1.2	1.2
COC (TN)	3.5	*	*	*	*	2.0	5.2	1.7	0.9	0.1

*Trap nets were not used from 1998-2001

NOP (Northern Pike), WAE (Walleye), BLG (Bluegill), BLC (Black Crappie), SMB (Smallmouth Bass), GSF (Green Sunfish), HYB (Hybrid Sunfish), YEP (Yellow Perch), BLB (Black Bullhead), COC (Common Carp)

Creel Survey Results

Summer 2006 fishing pressure on Lake Sinai was similar to 2005 (Table 11). Pressure was highest in July (7,541 hours) followed by June (5,804 hours). Anglers primarily targeted walleyes (64%) and yellow perch (20%). Nearly 98% of parties interviewed were South Dakota residents.

Walleye catch and harvest increased in 2006 (Table 11). Anglers enjoyed a high catch rate (0.80 fish/h), however, most fish were voluntarily released (seven out of eight) because of their small size (Figure 4). About 75% of the walleyes harvested were less than 35.6 cm (14 in) in length.

The yellow perch harvest decreased slightly from 2005 (Table 11). Fishing was still good with anglers harvesting nearly two fish per hour in late-summer. Many harvested perch measured 20-25 cm (8-10 in) long and were from multiple year classes (Figure 4).

Smallmouth bass catch and harvest increased in 2006 (Table 11). Anglers caught over 3,000 bass and harvested an estimated 327 fish. Most of the harvested bass were 25-30 cm (10-12 in) long.

Bluegill catch increased in 2006, but few fish were harvested.

Table 11. Estimates of fishing pressure and catch (harvest) of fish on Lake Sinai from May through August 2005-2006.

Year	Pressure (h)	Walleye Catch (Harvest)	Yellow Perch Catch (Harvest)	Northern Pike Catch (Harvest)	Smallmouth Bass Catch (Harvest)	Bluegill Catch (Harvest)
2006	20,947	16,716 (2,131)	8,360 (5,818)	30 (0)	3,042 (327)	1,544 (22)
2005	20,541	5,433 (1,184)	10,831 (8,699)	129 (24)	1,082 (186)	100 (46)

Table 12. Number of interviews and estimates of catch and harvest rates (number/hour) on Lake Sinai from May through August 2005.

Year	Number of Interviews	Walleye Catch (Harvest)	Yellow Perch Catch (Harvest)	Northern Pike Catch (Harvest)	Smallmouth Bass Catch (Harvest)	Bluegill Catch (Harvest)
2006	259	0.80 (0.10)	0.40 (0.28)	0.001 (0)	0.15 (0.02)	0.07 (0.001)
2005	470	0.27 (0.06)	0.53 (0.42)	0.006 (0.001)	0.05 (0.01)	0.001 (0.001)

Table 13. Stocking record for Lake Sinai, Brookings County, 1991-2006.

Year	Number	Species	Size
1991	32,115	Yellow Perch	Fingerling
1992	30,399	Yellow Perch	Fingerling
	22,480	Walleye	Lrg. Fingerling
1993	19,644	Walleye	Lrg. Fingerling
1994	30,950	Bluegill	Fingerling
	19,268	Walleye	Lrg. Fingerling
1995	32,000	Bluegill	Fingerling
	60,000	Largemouth Bass	Fingerling
1996	1,994	Bluegill	Fingerling
	192,540	Walleye	Fingerling
1998	2,400,000	Walleye	Fry
1999	11,689	Yellow Perch	Adult
2002	65	Smallmouth Bass	Adult
2003	57,470	Smallmouth Bass	Fingerling
2004	170,200	Walleye	Fingerling
	13,440	Smallmouth Bass	Fingerling
2005	58,340	Smallmouth Bass	Fingerling
2006	173,060	Walleye	Fingerling

MANAGEMENT RECOMMENDATIONS

1. Monitor the Lake Sinai fishery by conducting annual netting, electrofishing and creel surveys.
2. Achieve the walleye management objective stocking fry or fingerlings into voids of natural reproduction as determined by fall electrofishing surveys.
3. Consider the stocking of fingerling or adult yellow perch if natural reproduction fails to maintain population density at objective levels.

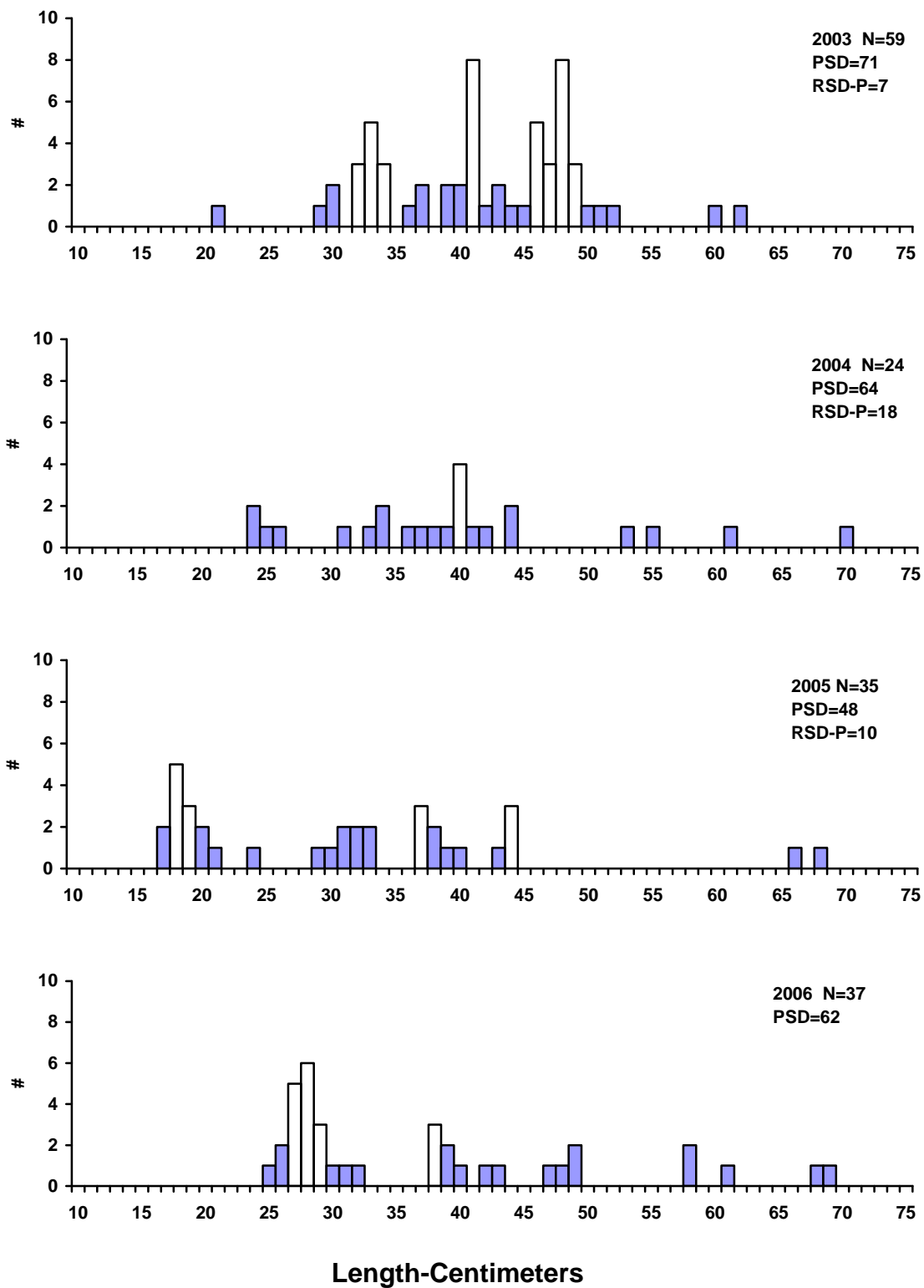


Figure 1. Length frequency histograms for walleyes sampled with gill nets in Lake Sinai, Brookings County, 2003-2006.

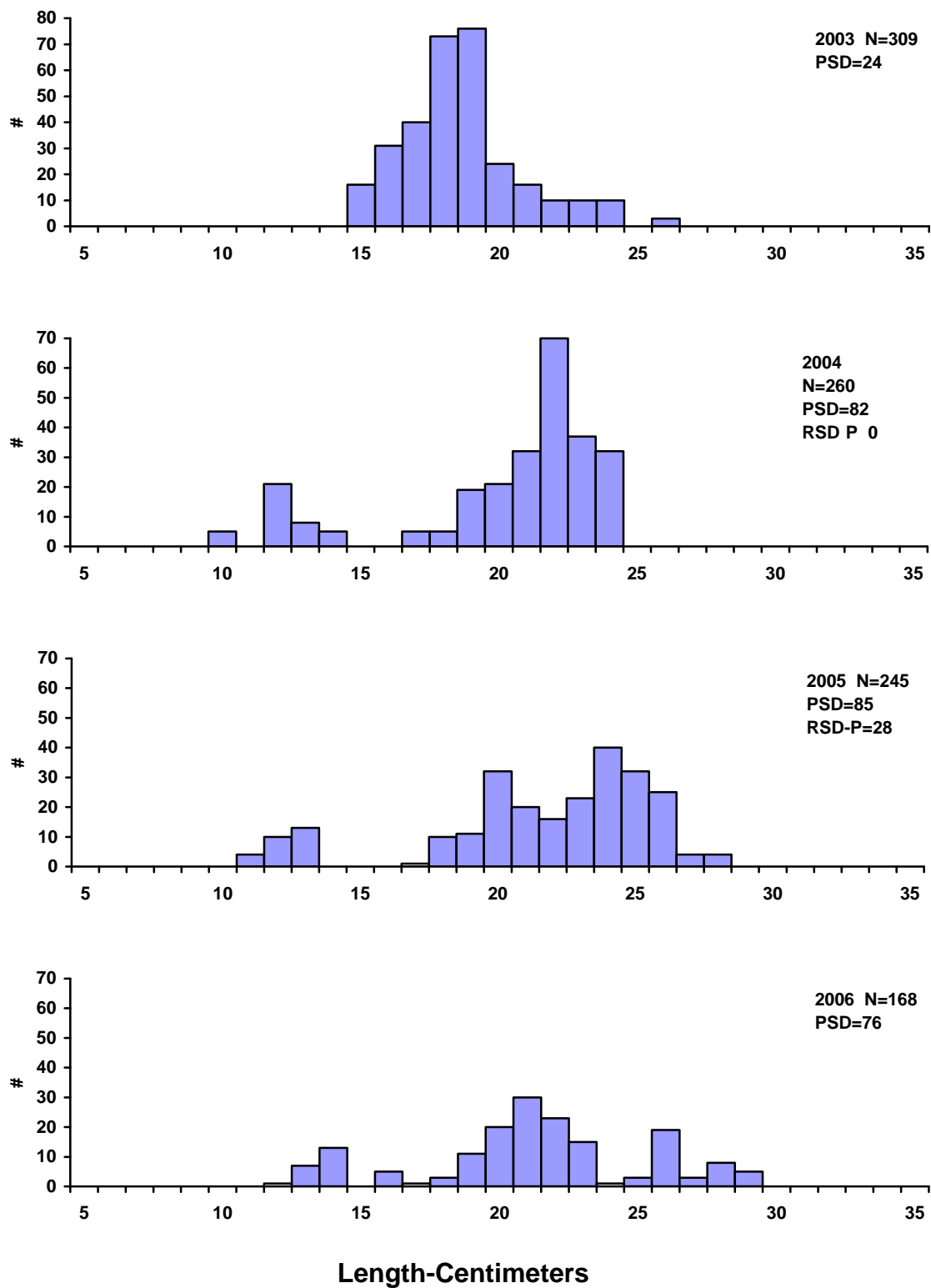


Figure 2. Length frequency histograms for yellow perch sampled with gill nets in Lake Sinai, Brookings County, 2003-2006.

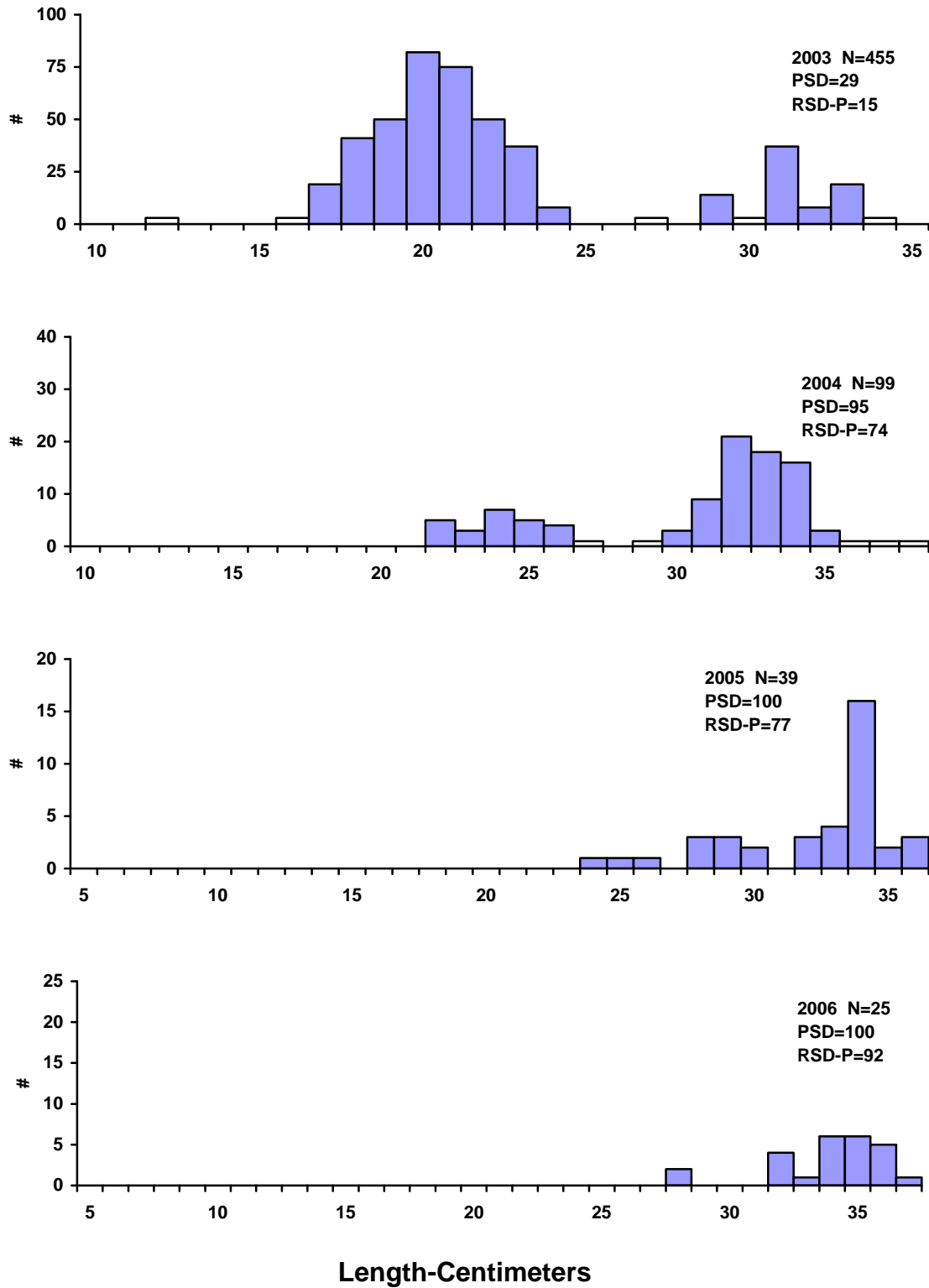


Figure 3. Length frequency histograms for black bullheads sampled with trap nets in Lake Sinai, Brookings County, 2003-2006.

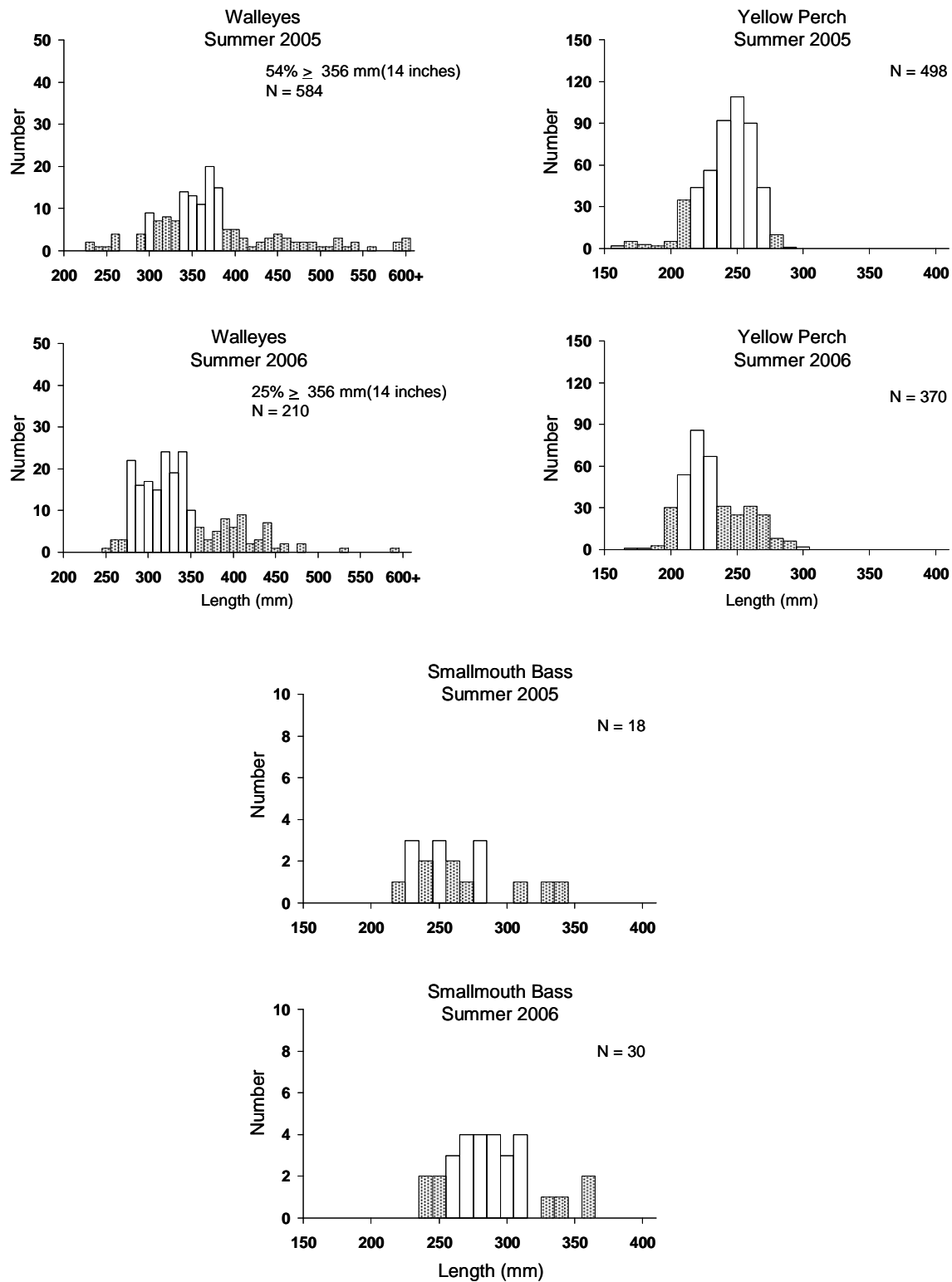
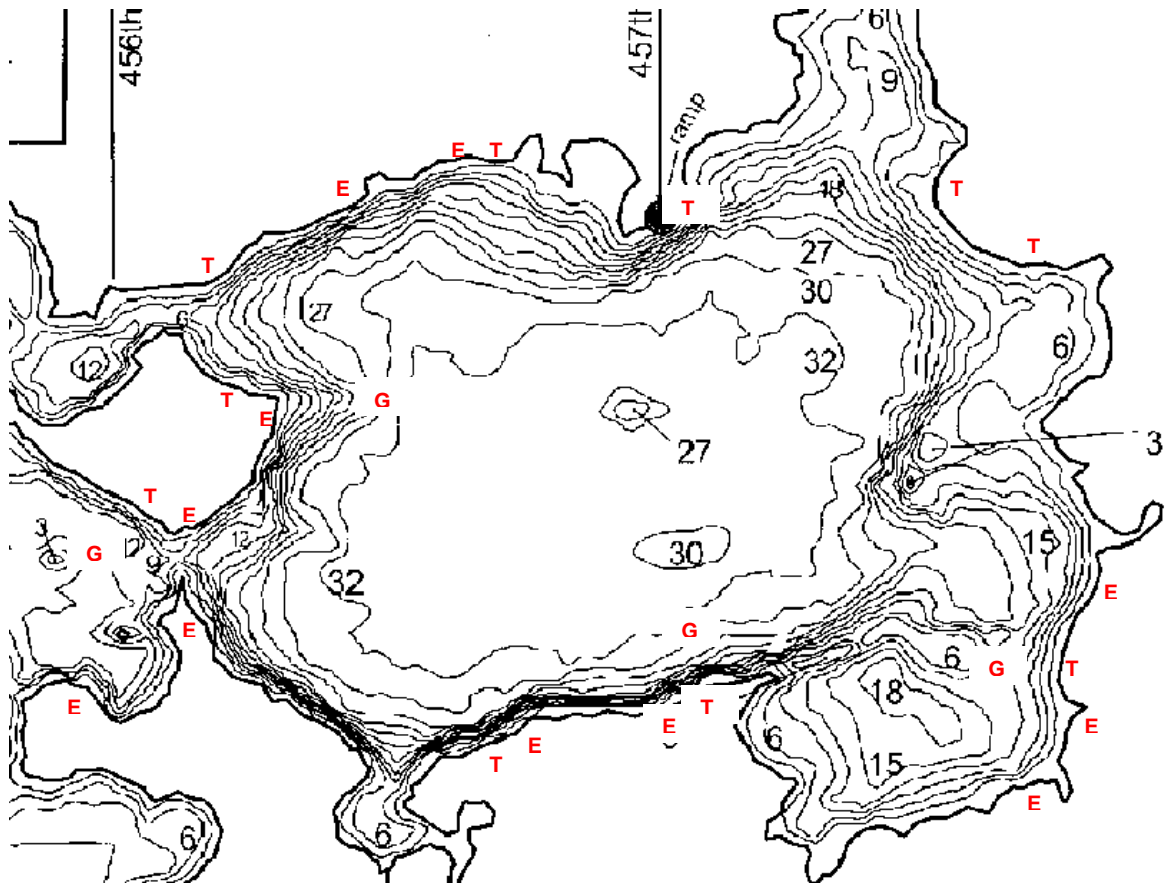


Figure 4. Length frequency of angler-harvested walleyes, yellow perch and smallmouth bass measured by the creel clerk during summer creel surveys on Lake Sinai, 2005-2006.



Legend

Gill Net Sites: **G**

Trap Net Sites: **T**

Electrofishing Sites: **E**

Figure 5. Sampling locations on Lake Sinai, Brookings County, 2006.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-39

Name: West Oakwood Lake **County:** Brookings
Legal Description: T111N- R51W-Sec. 1, 3, 5-8, 12, 32, 36
Location from nearest town: 5 miles west of Bruce, SD.

Dates of present survey: July 31, 2006-August 2, 2006
Date last surveyed: August 2-5, 2004

Primary Game and Forage Species	Other Species
Walleye	Northern Pike
Yellow Perch	Bigmouth Buffalo
.	Carp
	White Sucker
	Black Bullhead

PHYSICAL DATA

Surface Area: 1,200 acres	Watershed: 43,363 acres
Maximum depth: 10 feet	Mean depth: 6 feet
Volume: No data	Shoreline length: No data
Contour map available: Yes	Date mapped: 1964
OHWM elevation: 1626.9	Date set: October, 1981
Outlet elevation: 1626.4	Date set: October, 1981
Lake elevation observed during the survey: 2 feet low	
Beneficial use classifications: (5) warmwater semi-permanent fish propagation, (7) immersion recreation, (8) limited-contact recreation and (9) fish and wildlife propagation and stock watering.	

Introduction

The Oakwood Lakes complex derived its name from the numerous oak trees found in the area. East Oakwood Lake was originally named Oakwood Lake while West Oakwood was originally known as Lake Tetonkaha.

Ownership of Lake and Adjacent Lakeshore Property

West Oakwood is listed as a meandered lake in the State of South Dakota Listing of Meandered Lakes and the South Dakota Department of Game, Fish and Parks (GFP) manages the fishery. Much of the north and east shoreline is owned and managed by GFP as a Game Production Area and the Oakwood Lake State Recreation Area. The remainder of the shoreline is privately owned.

Fishing Access

Oakwood Lake State Recreation Area contains a two-lane boat ramp, dock, parking lot, public toilets, modern campground, and a handicapped-accessible fishing dock. Shore fishing sites are easily found throughout the area.

Field Observations of Water Quality and Aquatic Vegetation

The Secchi depth measurement was reduced to only 10 cm (4 in) by a severe algae bloom during the survey. Scattered stands of common cattail (*Typha spp.*) were observed around the lake.

BIOLOGICAL DATA

Methods:

West Oakwood Lake was sampled on July 31, 2006-August 2, 2006 with two overnight gill net sets and 10 overnight trap net sets. The trap nets are constructed with 19-mm-bar-mesh ($\frac{3}{4}$ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh ($\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, and 2 in) monofilament netting. Gill-net and trap-net sites are displayed in Figure 4.

Results and Discussion:

Gill Net Catch

Yellow perch (43.7%), walleye (33.1%), and black bullhead (12.8%) were the most abundant species sampled in the gill nets (Table 1). Lesser numbers of common carp, white suckers, northern pike, and bigmouth buffalo were also caught.

Table 1. Total catch from two overnight gill net sets at West Oakwood Lake, Brookings County, July 31, 2006-August 2, 2006.

Species	Number	Percent	CPUE ¹	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Yellow Perch	164	43.7	82.0	± 30.8	80.0	45	3	97
Walleye	124	33.1	62.0	± 14.1	20.9	29	0	95
Black Bullhead	48	12.8	24.0	± 2.6	85.9	35	0	89
Common Carp	20	5.3	10.0	± 5.1	20.1	58	25	92
White Sucker	11	2.9	5.5	± 3.2	5.2	20	10	86
Northern Pike	5	1.3	2.5	± 0.6	2.8	--	--	--
Bigmouth Buffalo	3	0.8	1.5	± 0.6	3.6	--	--	--

* 5 years (1996, 1998, 2000, 2002, 2004)

¹ See Appendix A for definitions of CPUE, PSD, and mean Wr.

Trap Net Catch

Black bullheads comprised 87.1% of the trap net sample (Table 2). The remainder of the catch consisted of common carp, walleye, yellow perch, white sucker, bigmouth buffalo, and northern pike.

Table 2. Total catch from 10 overnight trap net sets at West Oakwood Lake, Brookings County, July 31, 2006-August 2, 2006.

Species	Number	Percent	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	3,004	87.1	300.4	<u>+54.0</u>	791.8	27	0	98
Common Carp	138	4.0	13.8	<u>+3.8</u>	34.3	59	37	102
Walleye	135	3.9	13.5	<u>+3.7</u>	3.8	30	0	104
Yellow Perch	107	3.1	10.7	<u>+5.4</u>	4.9	18	1	99
White Sucker	28	0.8	2.8	<u>+0.9</u>	7.8	39	25	106
Bigmouth Buffalo	16	0.5	1.6	<u>+0.8</u>	2.5	94	6	94
Northern Pike	4	0.1	0.4	<u>+0.3</u>	1.6	--	--	--

* 5 years (1996, 1998, 2000, 2002, 2004)

Walleye

Management objective: Maintain a walleye population with a gill-net CPUE of at least 15, a PSD range of 30-60, and a growth rate of 14 inches by age-3.

Walleye CPUE and growth exceeded and PSD nearly met our management objectives (Table 3). The fish sampled ranged in length from 166-507 mm (6-20 in) (Figure1) and comprised four year-classes (Table 4). Walleye fingerlings stocked in 2004 (Table 9) produced a strong year class and another strong year class was naturally produced in 2005. The strength of the 2006 year class is uncertain because the fish had not fully recruited to our gill-nets at the time of the survey. Young walleyes in West Oakwood are in good condition and grow fast. The good walleye fishing experienced in 2006 should continue into 2007.

Table 3. Walleye gill-net CPUE, PSD, RSD-P and mean Wr for West Oakwood Lake, Brookings County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CPUE		39.0		9.7		5.0		9.0		62.0
PSD		10		63		0		100		29
RSD-P		4		22		0		0		0
Mean Wr		94		90		102		91		95

Table 4. Average back-calculated lengths (mm) for each age class of walleye in West Oakwood Lake, Brookings County, 2006.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2006	0	2								
2005	1	92	118							
2004	2	29	166	353						
2001	5	1	214	370	444	469	494			
All Classes		124	166	361	444	469	494			
Statewide Mean			168	279	360	425	490			
Region III Mean			173	281	367	435	517			
LLI* Mean			169	280	358	425	494			

Yellow Perch

Management objective: Maintain a yellow perch population with a gill-net CPUE of at least 25 and a PSD range of 30-60.

Yellow perch gill-net CPUE and PSD met our objectives in 2006 (Table 5). The fish sampled ranged in length from 134-266 mm (5-11 in) (Figure2) and were represented by three year-classes (Table 6). Growth is slower than observed in previous surveys but still consistent with statewide, regional and large lakes means (Table 6).

Table 5. Yellow perch gill-net CPUE, PSD, and mean Wr for West Oakwood Lake, Brookings County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CPUE		80.0		10.7		75.0		70.5		82.0
PSD		12		12		6		38		45
RSD-P		1		0		1		34		3
Mean Wr		95		95		108		95		97

Table 6. Average back-calculated lengths (mm) for each age class of yellow perch in West Oakwood Lake, Brookings County, 2006.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2005	1	75	98							
2004	2	85	75	180						
2003	3	4	72	136	197					
All Classes		164	82	158	197					
Statewide Mean			86	145	190	220	242			
Region III Mean			94	159	208	242	281			
LLI* Mean			86	146	192	225	249			

*Large Lakes and Impoundments (>150 acres)

Black Bullhead

Management objective: Maintain a black bullhead population with a trap-net CPUE of 100 or less.

Black bullhead trap net CPUE has been slowly decreasing since 2000 (Table 7). No large year classes have been recently produced resulting in lower abundance and larger fish (Figure 3). West Oakwood bullheads grow to a maximum length of about 25 cm (10 in) and apparently die of natural causes.

Table 7. Black bullhead trap-net CPUE, PSD and RSD-P for West Oakwood Lake, Brookings County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CPUE		497.2		1345.4		1170.0		935.3		300.4
PSD		69		2		54		1		27
RSD-P		1		0		0		0		0

All Species

Northern pike, common carp, and white sucker abundance has remained relatively steady over the years (Table 8).

Table 8. Gill-net (GN) and trap-net (TN) CPUE for all fish species sampled in West Oakwood Lake, Brookings County, 1997-2006.

Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
NOP (GN)		1.5		2.3		2.0		4.5		2.5
NOP (TN)		2.0		1.1		1.5		0.7		0.4
WAE (GN)		39.0		9.7		8.3		9.0		62.0
WAE (TN)		3.4		3.6		0.3		7.6		13.5
OSF (GN)		--		--		--		0.5		--
OSF (TN)		--		--		--		--		--
YEP (GN)		80.0		10.7		75.0		70.5		82.0
YEP (TN)		8.8		0.4		0.1		4.4		10.7
WHB (GN)		--		--		--		--		--
WHB (TN)		--		--		--		0.1		--
YEB (GN)		--		--		--		--		--
YEB (TN)		--		--		--		0.2		--
BLB (GN)		60.5		136.7		72.0		159.5		24.0
BLB (TN)		497.2		1,345.4		1,170.0		935.3		300.4
BIB (GN)		--		4.3		0.3		1.0		1.5
BIB (TN)		1.6		3.2		0.4		3.5		1.6
COC (GN)		36.0		10.7		36.7		15.0		10.0
COC (TN)		122.8		10.3		24.9		9.6		13.8
WHS (GN)		6.0		3.0		10.0		7.0		5.5
WHS (TN)		6.4		4.1		11.5		10.8		2.8

NOP (Northern Pike), WAE (Walleye), OSF (Orange-spotted Sunfish), YEP (Yellow Perch), WHB (White Bass), YEB (Yellow Bullhead), BLB (Black Bullhead), BIB (Bigmouth Buffalo), COC (Common Carp), WHS (White Sucker).

MANAGEMENT RECOMMENDATIONS

1. West Oakwood is capable of producing a fast-growing walleye population as long as it does not winterkill. Walleyes may help control the black bullhead population. Walleyes should be stocked after a winterkill or as needed to accomplish management objectives.
2. Stock yellow perch adults following winterkills or as needed to accomplish management objectives.
3. Continue to monitor the fishery by conducting lake surveys every other year.
4. Encourage commercial fishing for common carp, bigmouth buffalo and black bullheads.

Table 9. Stocking record for West Oakwood Lake, Brookings County, 1990-2006.

Year	Number	Species	Size
1990	38,016	Yellow Perch	Fingerling
1991	21,370	Yellow Perch	Fingerling
	2,030	Walleye	Lrg. Fingerling
	788	Walleye	Fingerling
1992	60,000	Northern Pike	Fingerling
	29,900	Largemouth Bass	Med. Fingerling
1993	1,200,000	Walleye	Fry
1994	132,700	Saugeye	Sml. Fingerling
	17,020	Yellow Perch	Juvenile
	4,082	Yellow Perch	Adult
1997	220,000	Walleye	Fingerling
1999	1,200,000	Walleye	Fry
2001	79,300	Walleye	Fingerling
	12,221	Yellow Perch	Adult
2004	119,100	Walleye	Fingerling
2006	1,201,589	Walleye	Fry

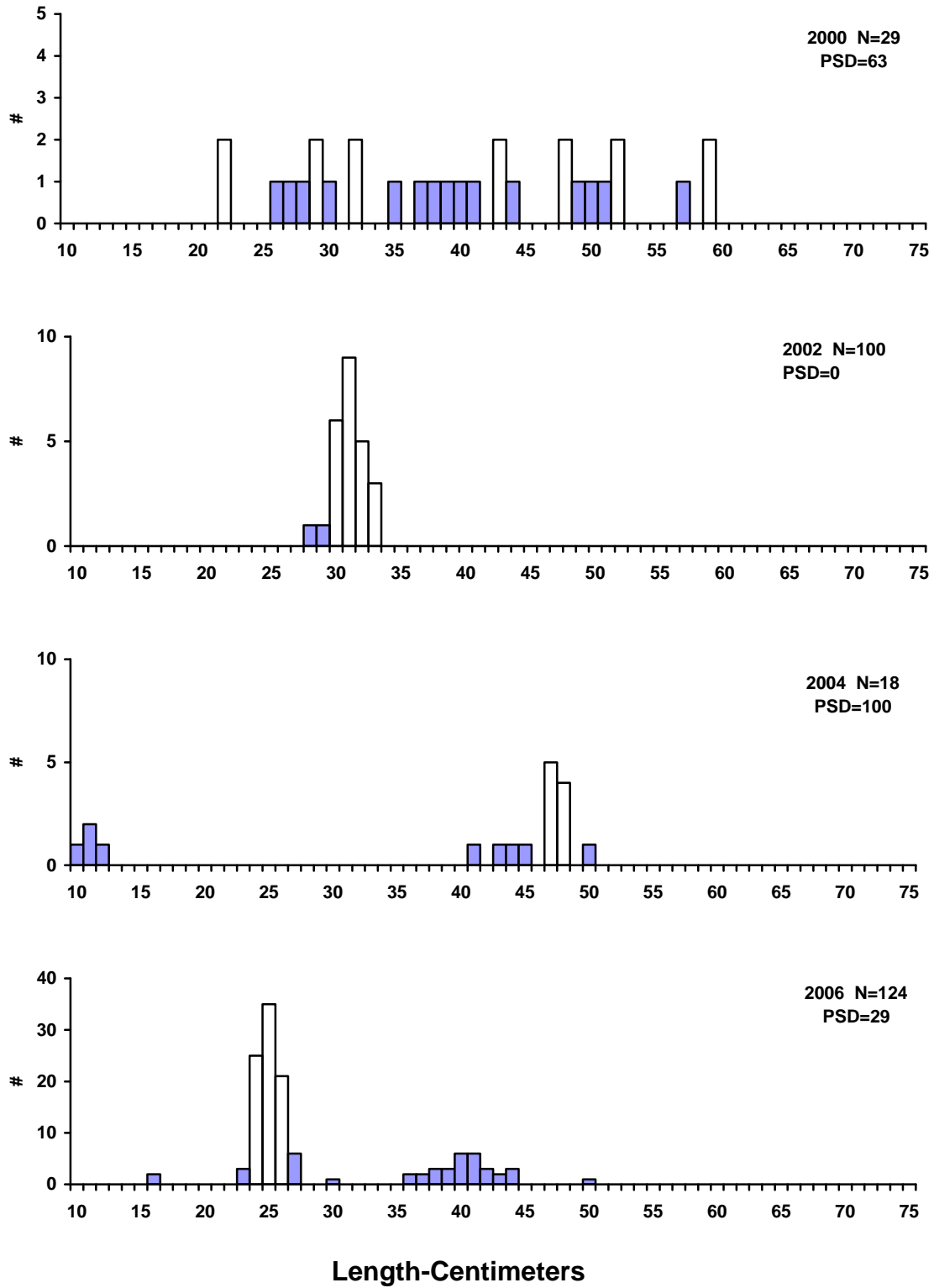


Figure 1. Length frequency histograms for walleyes sampled with gill nets in West Oakwood Lake, Brookings County, 2000, 2002, 2004 and 2006.

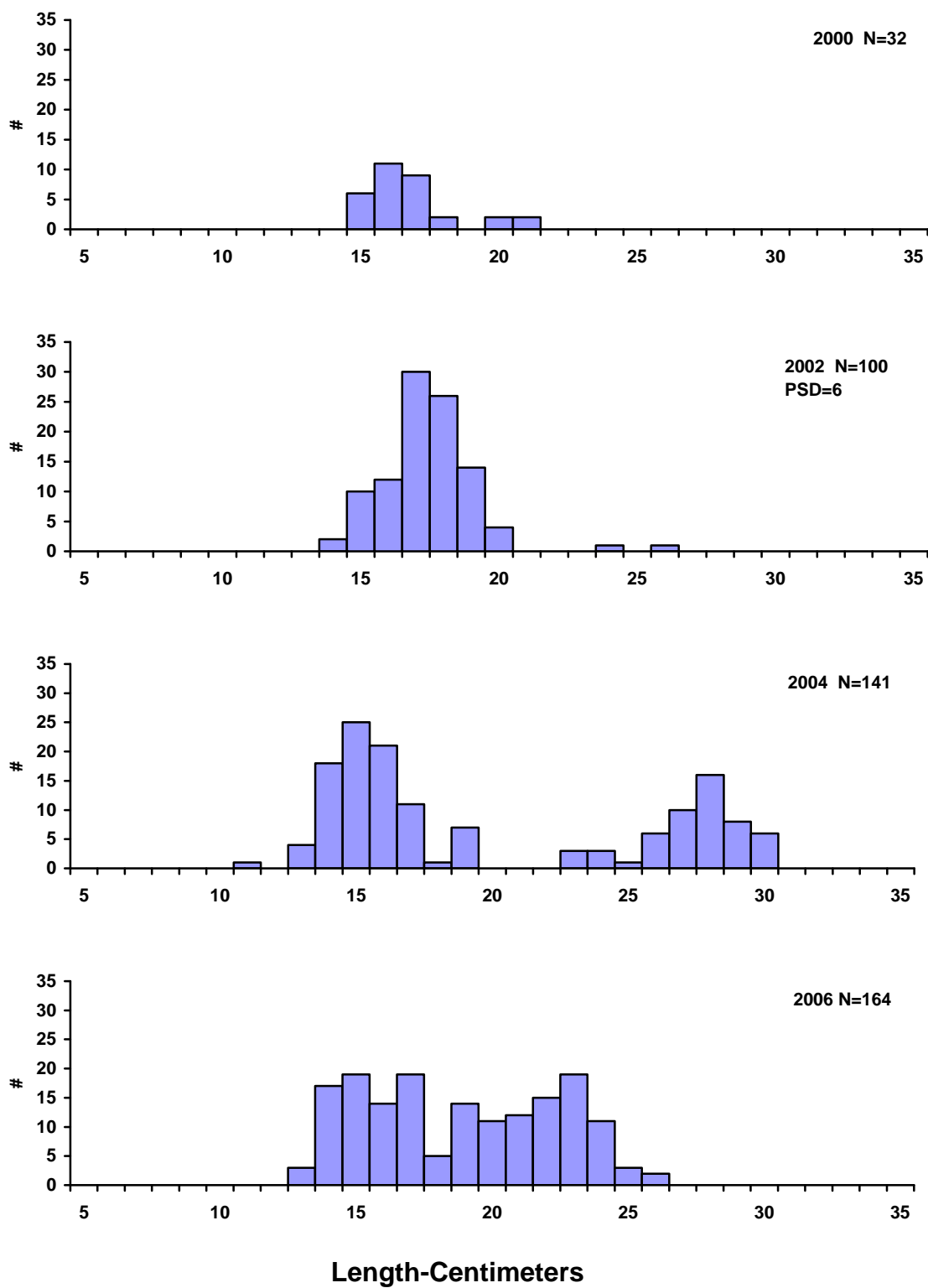


Figure 2. Length frequency histograms for yellow perch sampled with gill nets in West Oakwood Lake, Brookings County, 2000, 2002, 2004 and 2006.

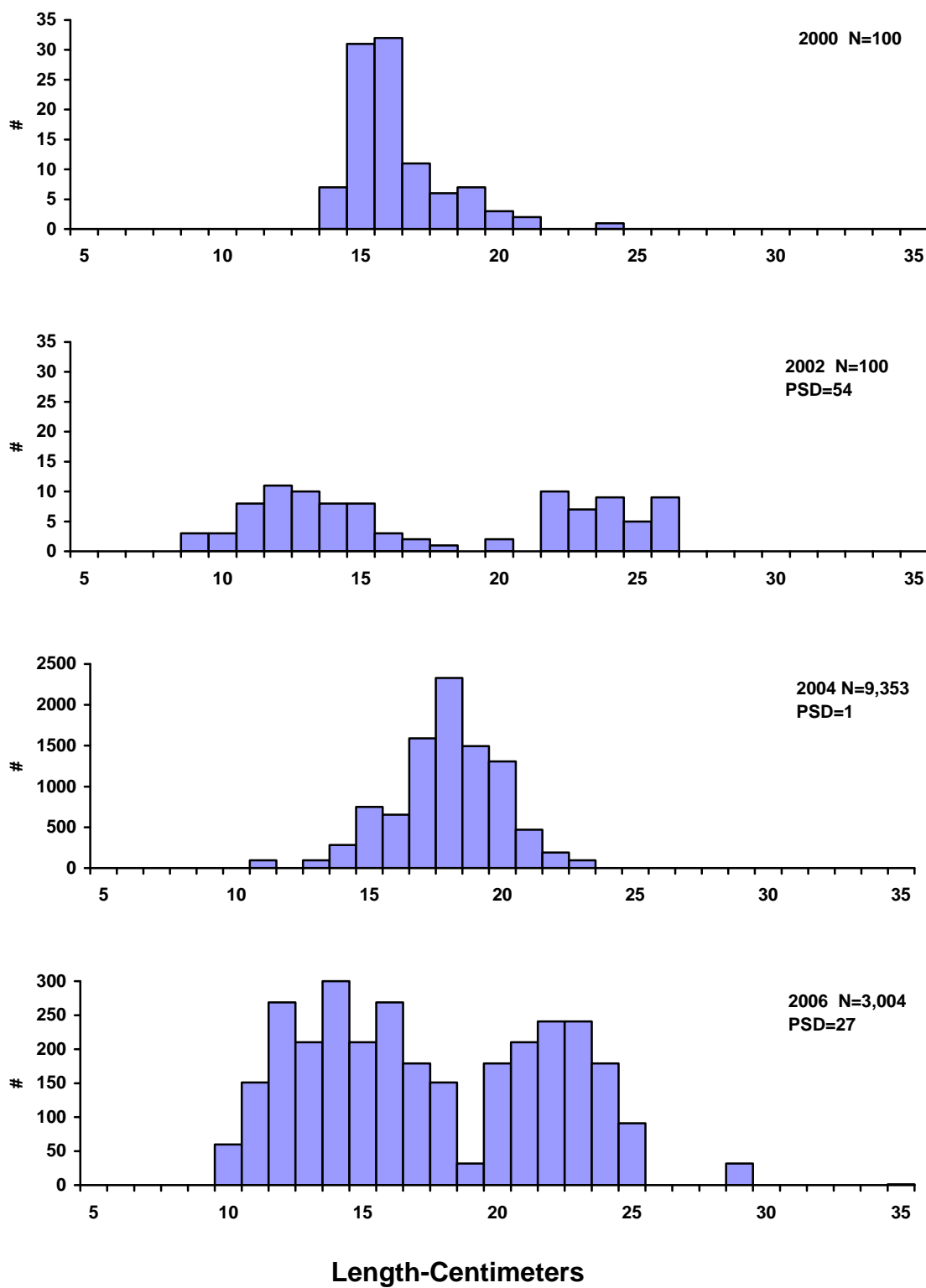


Figure 3. Length frequency histograms for black bullheads sampled with trap nets in West Oakwood Lake, Brookings County, 2000, 2002, 2004 and 2006.

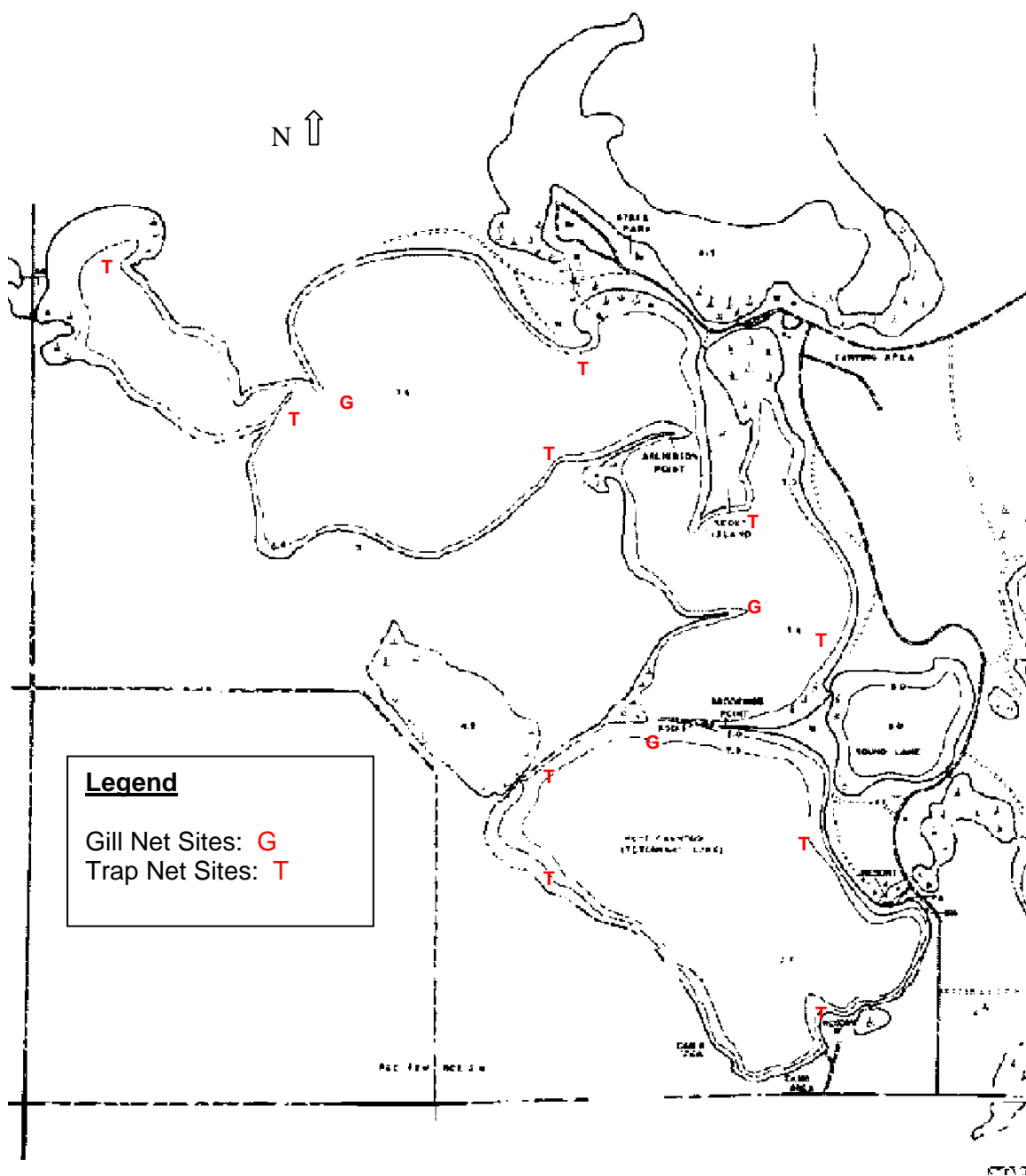


Figure 4. Sampling locations on West Oakwood Lake, Brookings County, 2006.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-39

Name: Lake Mitchell

County: Davison

Legal Description: T103W- R60N-Sec 4-6, 9; T104N- R60W-Sec 31-32

Location from nearest town: Northwest side of Mitchell, SD

Dates of present survey: July 10-12, 2006 (netting) and September 28, 2006 (electrofishing)

Date last surveyed: July 11-13, 2005 (netting) and June 15, 2005 (electrofishing)

Primary Game Species	Other Species
Bluegill	Channel Catfish
Black Crappie	White Crappie
Largemouth Bass	Northern Pike
Smallmouth Bass	Freshwater Drum
	Black Bullhead
	Common Carp
	White Sucker
	Shorthead Redhorse
	Walleye

PHYSICAL DATA

Surface Area: 670 acres

Watershed area: 229,911 acres

Maximum depth: 29 feet

Mean depth: 12.2 feet

Volume: 8,212 acre-feet

Shoreline length: 10 miles

Contour map available: Yes

Date mapped: 1970

Lake elevation observed during the survey: Full

Beneficial use classifications: (1) domestic water supply, (4) warmwater permanent fish propagation, (7) immersion recreation, (8) limited-contact recreation and (9) wildlife propagation and stock watering.

Introduction

Lake Mitchell was constructed in 1928 by the City of Mitchell to serve as a domestic water supply and a regional recreation center. The primary source of water is Firesteel Creek, which has two main branches and drains a watershed that extends 50 miles above the lake.

Ownership of Lake and Adjacent Shoreline Properties

Lake Mitchell is owned by the City of Mitchell. The South Dakota Department of Game, Fish, and Parks (GFP) manages the fishery. The City of Mitchell owns several public access areas and parks around the lake. The remainder of the lakeshore is privately owned and heavily developed.

Fishing Access

The West City Access Area has a double lane boat ramp, dock, parking lot, and public toilets. The Southeast City Access Area has a single lane boat ramp, dock, and parking lot. All access areas and parks provide ample shore fishing opportunities.

Field Observations of Water Quality and Aquatic Vegetation

The water in Lake Mitchell was fairly clear during the survey although some algae was present. The Secchi depth measurement was 2 m (79 in). Beds of sago pondweed (*Potamogeton pectinatus*), common cattail (*Typha spp.*), and duckweed (*Lemna spp.*) were common in the bays and creek arms. Large stands of common cattail were found in Kippes bay and the west end of the lake where it had been absent for several years.

BIOLOGICAL DATA

Methods:

Lake Mitchell was sampled on July 10-12, 2006 with six overnight gill net sets and twelve overnight trap net sets. The trap nets are constructed with 19-mm-bar-mesh ($\frac{3}{4}$ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh ($\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, and 2 in) monofilament netting. Two hours of nighttime electrofishing were done on September 28, 2006 to evaluate walleye recruitment. Sampling locations are displayed in Figure 4.

Results and Discussion:

Gill Net Catch

Shorthead redhorse (25.7%), freshwater drum (23.5%), black crappie (17.3%), and channel catfish (14.5%) were the most common species caught in the gill nets. The sample also included small numbers of five other species (Table 1).

Table 1. Total catch from six overnight gill net sets at Lake Mitchell, Davison County, July 10-12, 2006.

Species	Number	Percent	CPUE ¹	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Shorthead Redhorse	46	25.7	7.7	± 4.0	7.3	100	100	98
Freshwater Drum	42	23.5	7.0	± 4.0	8.5	95	5	91
Black Crappie	31	17.3	5.2	± 2.1	2.1	3	3	120
Channel Catfish	26	14.5	4.3	± 2.4	9.4	85	8	102
Walleye	12	6.7	2.0	± 0.9	2.6	92	8	89
Common Carp	7	3.9	1.2	± 0.6	1.6	--	--	--
White Sucker	7	3.9	1.2	± 1.0	0.3	--	--	--
Bluegill	5	2.8	0.8	± 0.4	0.4	--	--	--
Northern Pike	3	1.7	0.5	± 0.3	0.2	--	--	--

* 10 years (1996-2005)

¹ See Appendix A for definitions of CPUE, PSD, and mean Wr.

Trap Net Catch

Bluegill (45.2%) and black crappie (44.5%) were the most abundant species caught in trap nets (Table 2). Eleven additional species were also sampled.

Table 2. Total catch from twelve overnight trap net sets at Lake Mitchell, Davison County, July 10-12, 2006.

Species	Number	Percent	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Bluegill	619	45.2	53.4	+22.9	22.6	56	5	107
Black Crappie	609	44.5	49.5	+34.1	21.0	3	0	113
Shorthead Redhorse	50	3.7	3.3	+1.2	7.8	100	100	91
Common Carp	28	2.0	2.4	+1.1	3.1	46	18	96
Channel Catfish	18	1.3	1.5	+1.2	3.6	94	11	102
Largemouth Bass	18	1.3	1.6	+1.5	0.2	--	--	--
Black Bullhead	8	0.6	0.7	+0.9	1.5	--	--	--
Freshwater Drum	5	0.4	0.5	+0.3	0.6	--	--	--
Northern Pike	4	0.3	0.4	+0.2	0.3	--	--	--
White Crappie	4	0.3	0.2	+0.2	0.6	--	--	--
Smallmouth Bass	3	0.2	0.3	+0.2	0.6	--	--	--
White Sucker	1	0.1	0.1	+0.1	0.4	--	--	--
Green Sunfish	1	0.1	0.1	+0.1	0.0	--	--	--

* 10 years (1996-2005)

Walleye

Management objective: To establish and maintain a walleye population with a gill net CPUE of at least 5 and a growth rate of 35 cm (14 in) in three years.

Lake Mitchell contains a low-density walleye population maintained by natural reproduction (Table 3). The fish sampled in 2006 ranged in length from 36-51 cm (14-20 in). When stockings in 1993, 1995, 1997 and 1999 failed to increase walleye abundance, stocking was abandoned and the population has been maintained by natural reproduction ever since. However, due to requests from the public and the availability of new fish-marking technology, we decided to resume walleye stocking and evaluate the results. In 2006, Lake Mitchell was stocked with 67,760 walleye fingerlings marked with oxytetracycline (OTC), a chemical that causes bony structures in marked fish to glow under a special light.

Fall electrofishing indicated that a moderately-strong year class of walleyes was produced in 2006. However, OTC marks were present on only 25% of the age-0 walleyes examined indicating that most fish were naturally produced, not stocked. The size of age-0 walleyes was similar to 2000 and 2001, the last year that Lake Mitchell was fall electrofished. No yearling walleyes were captured.

Table 3. Walleye gill-net CPUE, PSD, RSD-P, and mean Wr for Lake Mitchell, Davison County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	2.0	3.0	1.7	2.0	1.7	3.0	3.3	1.8	1.1	2.0	2.6
PSD	--	21	--	--	--	45	10	45	--	92	37
RSD-P	--	0	--	--	--	18	0	0	--	8	4
Mean Wr	--	82	--	90	--	90	85	85	--	89	86

*10 years (1996-2005)

Table 4. Nighttime electrofishing CPUE for age-0 and age-1 walleyes in Lake Mitchell, Davison County, 1996-2006.

Year	Stocking	Age-0 CPH	80% C.I.	% stocked	Mean length (range; mm)	Wr	Age-1 CPH	80% C.I.	Mean length (range; mm)	Wr
2006	fingerling	58	36-80	25	165 (127-200)	86	0			
2001	none	73	33-111		187 (145-218)		2	0-3	267 (255-273)	
2000	none	21	9-33		173 (141-203)		23		230 (207-270)	

Black Crappie

Management objective: Maintain a black crappie fishery with a trap net CPUE of at least 20 and PSD of at least 40.

Black crappie abundance in Lake Mitchell is highly cyclical with low trap net catches occurring in 1995, 1999 and again in 2004-2005 (Table 5). A very large year class was produced in 2005 and growth is close to regional and large lake means (Table 6). However, mortality is high and few fish live past age-4.

Table 5. Black crappie trap-net CPUE, PSD, and mean Wr for Lake Mitchell, Davison County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	39.8	40.9	11.0	18.2	32.6	14.5	12.0	5.4	3.8	49.5	21.0
PSD	65	99	96	2	74	39	90	95	77	3	69
RSD-P	4	13	49	0	2	3	3	27	60	0	17
Mean Wr	118	116	108	121	118	120	105	102	110	113	114

*10 years (1996-2005)

Table 6. Average back-calculated lengths (mm) for each age class of black crappie in Lake Mitchell, Davison County, 2006.

Back-calculation Age										
Year Class	Age	N	1	2	3	4	5	6	7	8
2005	1	584	106							
2004	2	13	87	149						
2003	3	12	75	168	232					
All Classes		609	105	158	232					
Statewide Mean			83	147	195	229				
Region III Mean			95	167	219	253				
LLI Mean			89	161	210	247				

Bluegill

Management objective: Maintain a bluegill fishery with a trap net CPUE of at least 20 and RSD-18 of at least 20.

Bluegill trap net CPUE increased substantially this year (Table 7), due to year classes produced in 2003 and 2004 (Table 8 & Figure 3). Bluegill reproduction has been consistent with 1-7 year old fish all represented in the sample (Table 8). Growth and condition is excellent (Table 7 and 8) with fish reaching 20 cm (8 in) by age-5. Only nine percent of bluegills sampled in 2006 were longer than 18 cm (7 in); however, the percentage of larger fish should increase as fish from the 2003 and 2004 year classes continue growing.

Table 7. Bluegill trap-net CPUE, PSD, RSD-18, RSD-P, and mean Wr for Lake Mitchell, Davison County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	16.8	11.4	23.2	13.7	35.2	36.1	31.1	6.4	19.8	53.4	22.6
PSD	95	97	91	91	99	93	99	76	52	56	88
RSD-18	70	89	87	68	86	89	67	66	39	9	71
RSD-P	16	56	71	56	23	73	57	63	30	5	47
Mean Wr	113	111	105	115	116	116	112	99	117	107	112

*10 years (1996-2005)

Table 8. Average back-calculated lengths (mm) for each age class of bluegill in Lake Mitchell, Davison County, 2005.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2005	1	26	59							
2004	2	362	45	105						
2003	3	186	47	113	156					
2002	4	15	51	108	135	167				
2001	5	18	53	119	156	191	209			
2000	6	6	78	141	176	198	213	227		
1999	7	6	39	71	112	176	213	222	228	
All Classes		619	47	108	154	182	211	225	228	
Statewide Mean			55	103	141	166	180			
Region III Mean			60	116	157	180	190			
LLI Mean			62	109	149	173	180			

All Fish Species

Black crappie and bluegill trap-net CPUE and white sucker gill-net CPUE are at 10 - year highs. The CPUE for all other species was within previously observed ranges (Table 9). Lake Mitchell has a diverse fish community with 14 species sampled this year and 19 species sampled in the past ten years (Table 9).

Table 9. Gill-net (GN) or trap-net (TN) CPUE for all fish species sampled in Lake Mitchell, Davison County, 1997-2006.

Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CCF (GN)	1.5	7.0	10.2	19.0	19.0	7.3	15.0	3.3	5.3	4.3
CCF (TN)	0.8	0.4	0.7	2.1	4.9	2.4	16.8	3.9	3.2	1.5
LMB (GN)	--	--	--	--	--	--	--	--	--	--
LMB (TN)	--	0.1	0.2	0.7	--	0.5	0.3	0.1	0.2	1.6
NOP (GN)	--	0.4	0.2	0.2	0.2	--	--	0.5	0.6	0.5
NOP (TN)	0.1	0.6	0.2	0.1	0.2	0.5	0.3	0.5	0.2	0.4
SMB (GN)	--	--	--	0.2	--	--	0.3	--	--	--
SMB (TN)	1.6	0.7	0.6	0.2	0.3	0.4	0.6	0.1	0.3	0.3
WAE (GN)	2.0	3.0	1.7	2.0	1.7	3.0	3.3	1.8	1.1	2.0
WAE (TN)	0.4	0.2	0.6	1.8	0.7	0.9	--	0.4	0.4	--
BLC (GN)	--	1.6	0.2	1.2	6.7	0.5	2.7	0.3	0.5	5.2
BLC (TN)	39.8	40.9	11.0	18.2	32.6	14.5	12.0	5.4	3.8	49.5
BLG (GN)	--	0.2	--	0.2	0.7	0.3	0.7	0.8	0.9	0.8
BLG (TN)	16.8	11.4	23.2	13.7	35.2	36.1	31.1	6.4	19.8	53.4
GSF (GN)	--	--	--	--	--	--	--	--	--	--
GSF (TN)	--	--	--	--	--	--	0.3	--	--	0.1
OSF (GN)	--	--	--	--	--	--	--	--	--	--
OSF (TN)	--	--	--	--	--	--	--	--	0.1	--
HYB (GN)	--	--	--	--	--	--	--	--	--	--
HYB (TN)	0.1	--	--	--	--	0.2	--	--	--	--
WHC (GN)	--	3.0	0.5	--	0.2	0.2	0.3	0.2	--	--
WHC (TN)	0.9	1.5	2.1	0.7	0.4	0.5	--	0.1	--	0.2
YEP (GN)	--	--	--	0.2	--	--	--	--	--	--
YEP (TN)	--	0.1	--	--	--	--	--	--	--	--
BLB (GN)	3.5	0.4	12.5	19.6	2.3	0.3	--	0.3	--	--
BLB (TN)	0.2	0.2	4.6	7.1	1.2	0.4	0.2	--	0.2	0.7
BIB (GN)	--	--	0.3	--	--	0.2	1.0	--	--	--
BIB (TN)	--	--	0.1	--	--	--	--	--	0.1	--
COC (GN)	0.5	1.2	5.0	1.4	1.0	1.0	--	0.3	1.9	1.2
COC (TN)	0.7	2.6	5.6	3.7	3.2	1.5	2.1	2.6	4.8	2.4
FRD (GN)	3.0	9.0	9.0	11.2	7.7	17.8	6.3	6.7	10.0	7.0
FRD (TN)	0.7	0.2	0.4	0.9	0.7	1.0	0.3	1.2	0.2	0.5
RIC (GN)	--	--	--	--	--	--	--	--	0.1	--
RIC (TN)	--	--	--	--	--	--	--	--	--	--
SHR (GN)	1.0	3.0	1.5	7.0	9.7	9.5	20.0	9.3	6.0	7.7
SHR (TN)	2.0	2.9	4.4	21.9	12.2	9.5	5.6	6.8	10.2	3.3
WHS (GN)	0.5	--	--	--	0.3	0.2	--	0.8	0.8	1.2
WHS (TN)	0.2	0.5	0.2	0.7	0.1	0.6	0.3	0.1	0.6	0.1

CCF (Channel Catfish), LMB (Largemouth Bass), NOP (Northern Pike), SMB (Smallmouth Bass), WAE (Walleye), BLC (Black Crappie), BLG (Bluegill), GSF (Green Sunfish), OSF (Orangespotted Sunfish), HYB (Hybrid Sunfish), WHC (White Crappie), YEP (Yellow Perch), BLB (Black Bullhead), BIB (Bigmouth Buffalo), COC (Common Carp), FRD (Freshwater Drum), RIC (River Carpsucker), SHR (Shorthead Redhorse), WHS (White Sucker)

MANAGEMENT RECOMMENDATIONS

1. Continue to monitor the fishery with annual netting surveys and sample the bass population every other year with nighttime electrofishing.
2. Work with the city of Mitchell and local sportsmen to preserve and enhance water quality and aquatic habitat.
3. Stock OTC-marked walleye fingerlings every other year in an attempt to accomplish the management objective. Conduct fall electrofishing surveys annually to evaluate contributions of stocked and naturally-produced fish to the fishery.

Table 10. Stocking record for Lake Mitchell, Davison County, 1991-2006.

Year	Number	Species	Size
1991	67,000	Saugeye	Fingerling
1992	35,000	Largemouth Bass	Fingerling
	67,000	Saugeye	Fingerling
	35,000	Smallmouth Bass	Fingerling
1993	82,900	White Crappie	Fingerling
	70,000	Walleye	Fingerling
	67,200	Smallmouth Bass	Fingerling
1994	13,125	Channel Catfish	Fingerling
1995	12,438	Black Crappie	Adult
	67,000	Walleye	Fingerling
1996	22,746	Black Crappie	Fingerling
	3,198	Black Crappie	Adult
	42,500	Smallmouth Bass	Fingerling
1997	254,205	Walleye	Fingerling
1999	73,700	Walleye	Fingerling
	13,850	Walleye	Lrg. Fingerling
2003	20,640	Black Crappie	Fingerling
2006	67,760	Walleye	Fingerling

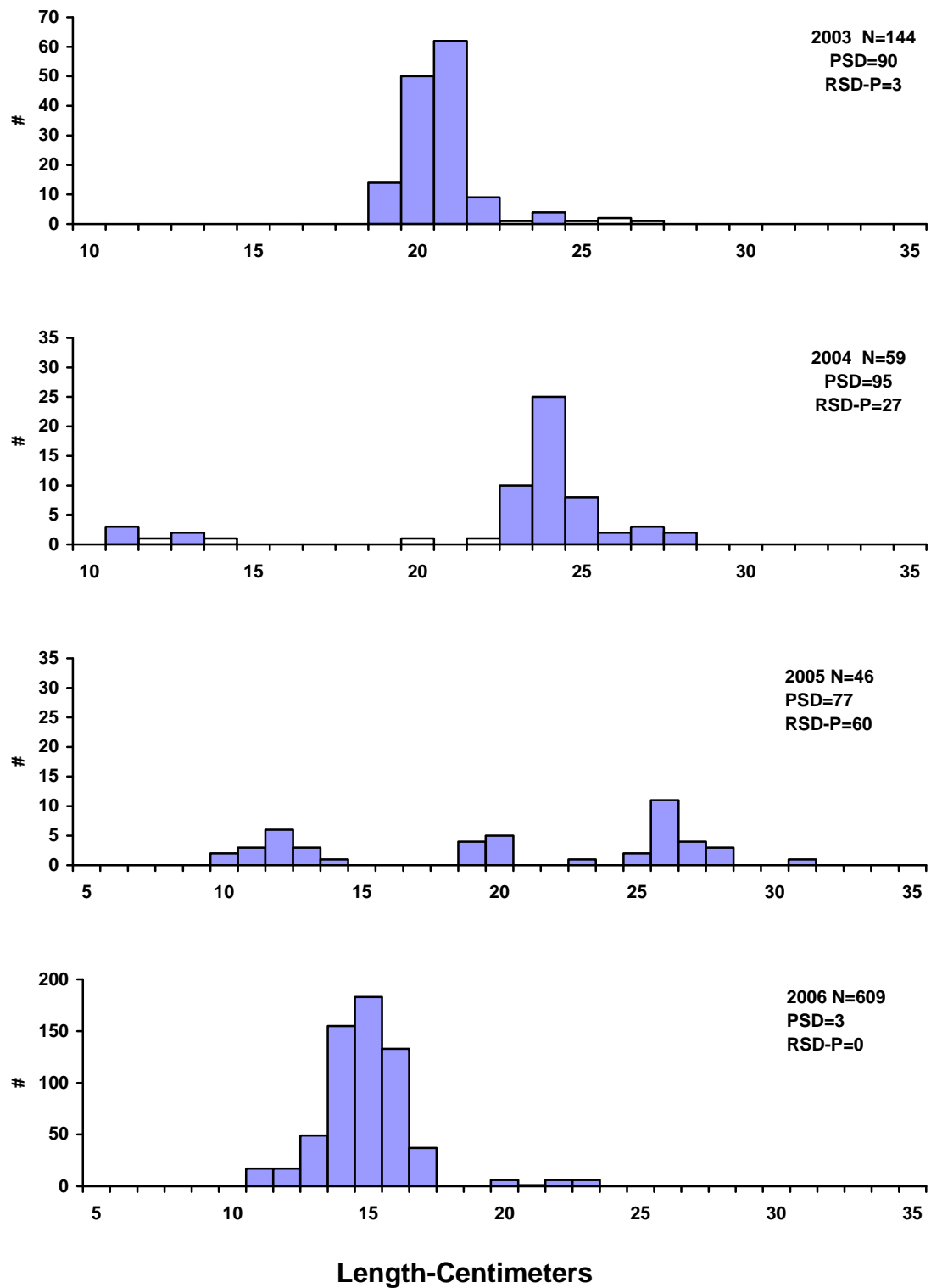


Figure 1. Length frequency histograms for black crappies sampled with trap nets in Lake Mitchell, Davison County, 2003-2006.

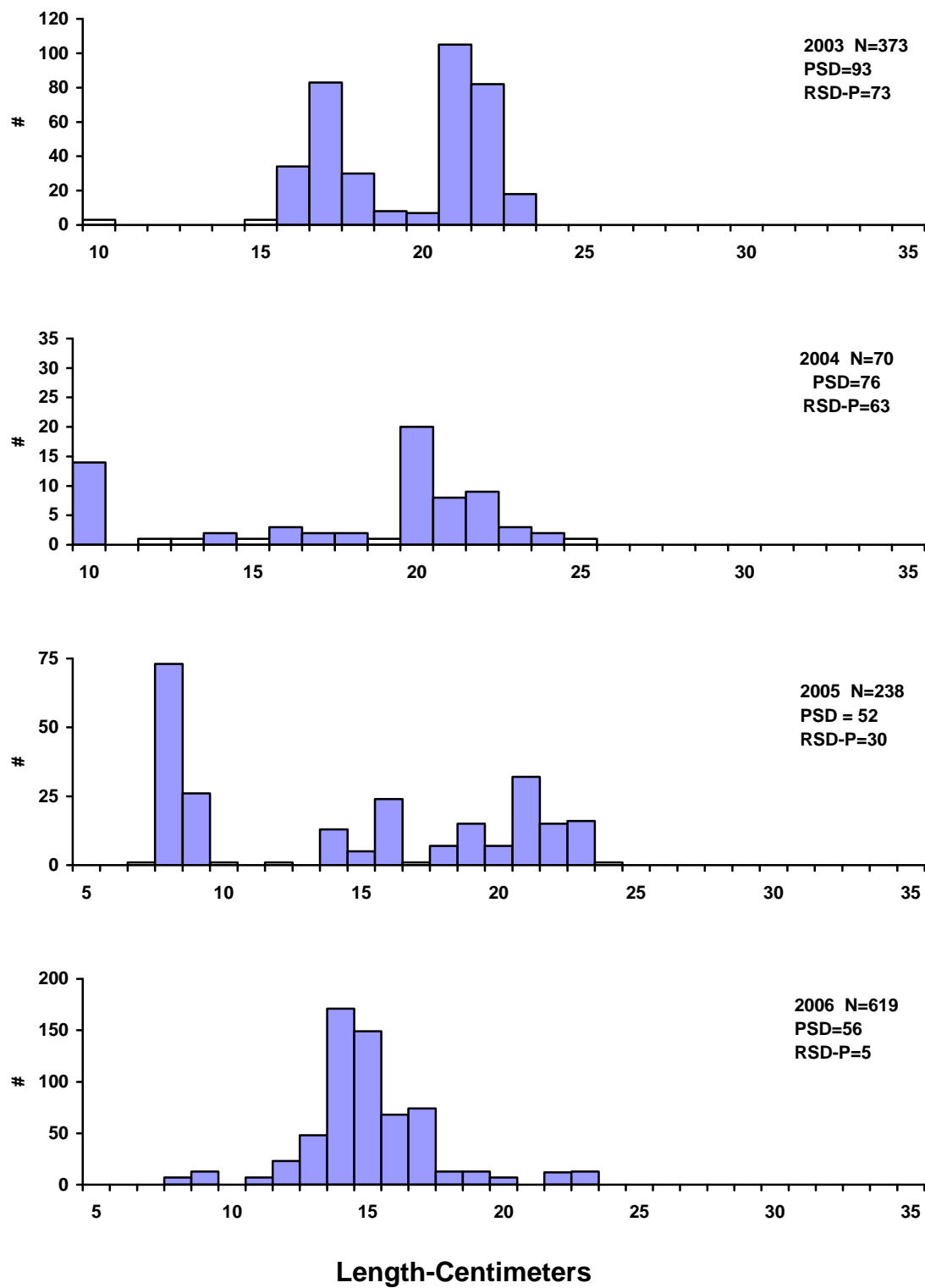
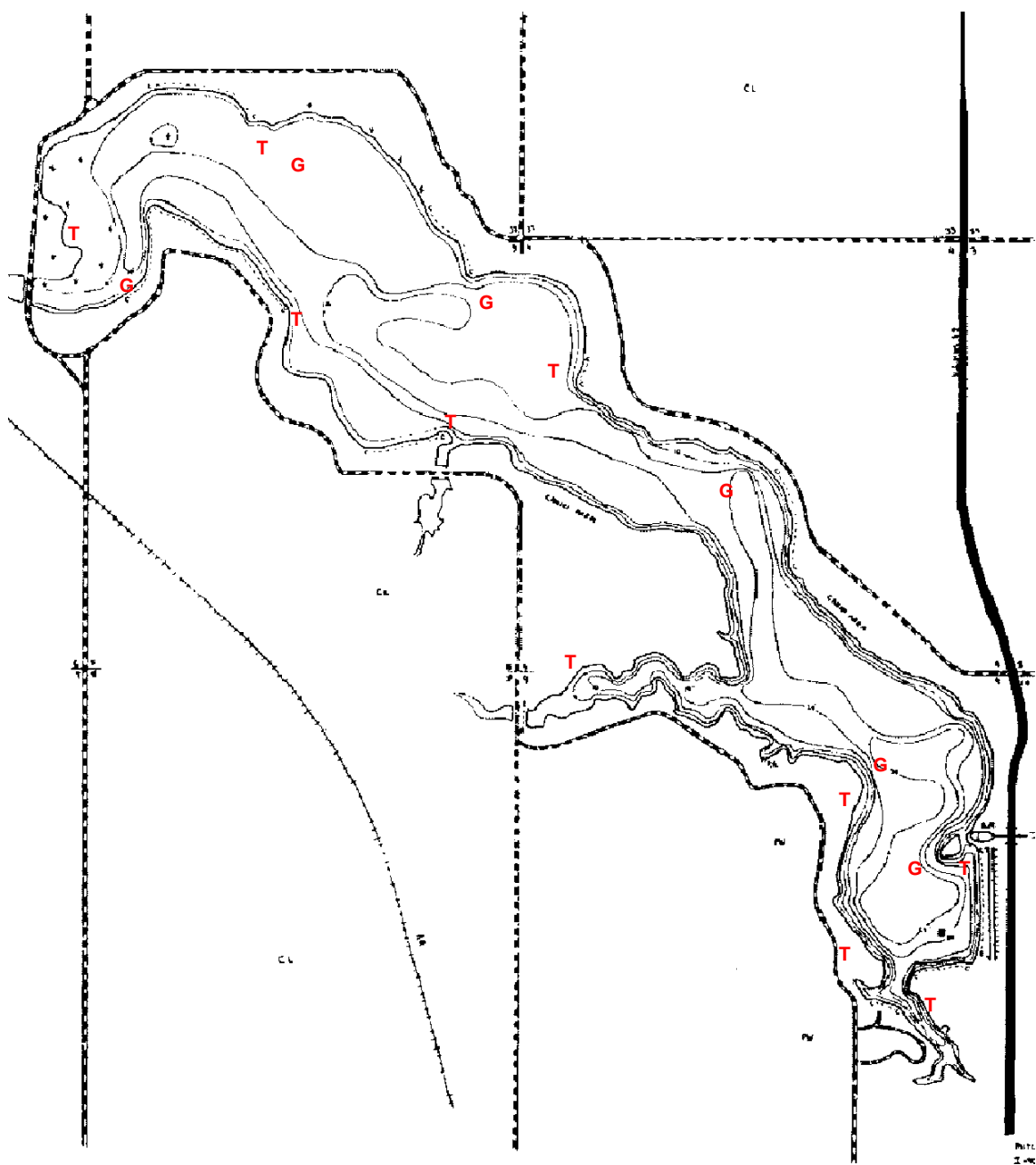


Figure 2. Length frequency histograms for bluegill sampled with trap nets in Lake Mitchell, Davison County, 2003-2006.



Legend
 Gill Nets: G
 Trap Nets: T

Figure 3. Sampling locations on Lake Mitchell, Davison County, 2006.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-39

Name: Ethan Dam

County: Hanson

Legal Description: T101-R59-Sec 17, 18

Location from nearest town: 2 miles east and 1/2 mile north of Ethan, SD

Dates of present survey: August 9-10, 2006

Date last surveyed: August 17-18, 2004

Primary Game and Forage Species	Other Species
Black Crappie	Black Bullhead
Northern Pike	Bigmouth Buffalo
Largemouth Bass	Common Carp

PHYSICAL DATA

Surface Area: 38.6 acres

Maximum depth: 11 feet

Volume: No data

Contour map available: Yes

OHWM elevation: None set

Outlet elevation: None set

Lake elevation observed during the survey: 2.5 feet low

Beneficial use classifications: (5) warmwater semipermanent fish propagation, (7) immersion recreation, (8) limited-contact recreation and (9) fish and wildlife propagation and stock watering.

Watershed: Unknown acres

Mean depth: 4.7 feet

Shoreline length: No data

Date mapped: 1970

Date set: NA

Date set: NA

Introduction

Ethan Lake is an artificial impoundment created by the construction of a dam across Twelve Mile Creek by the Works Progress Administration (WPA) in 1937. It was named after the nearby town of Ethan, South Dakota.

Ownership of Lake and Adjacent Lakeshore Property

The South Dakota Department of Game, Fish, and Parks (GFP) manages the lake and has easements for the original construction and for public access. Water rights for adjacent landowners to water livestock were included in these easements.

Fishing Access

Ethan Dam has a single lane, concrete plank boat ramp located on the west shore near the dam. Cattails inhibit shore fishing around much of the lake.

Field Observations of Water Quality and Aquatic Vegetation

The water in Ethan Dam was very turbid during the survey with a Secchi depth measurement of 20 cm (8 in). Scattered beds of common cattail (*Typha spp.*) surround the entire shoreline and no submerged vegetation was observed.

BIOLOGICAL DATA

Methods:

Ethan Dam was sampled on August 9-10, 2006 with five overnight trap net sets. The trap nets are constructed with 19-mm-bar-mesh ($\frac{3}{4}$ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. Trap-net sites are displayed in Figure 4.

Results and Discussion:

Trap-Net Catch

Black bullheads comprised 51.5% of the trap-net sample (Table 1). Other species sampled included black crappie, northern pike, white crappie, common carp, bigmouth buffalo, and channel catfish.

Table 1. Total catch from five overnight trap net sets at Ethan Dam, Hanson County, August 9-10, 2006.

Species	Number	Percent	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	34	51.5	6.8	± 4.1	242.8	24	0	74
Black Crappie	17	25.8	3.4	± 0.9	5.4	47	24	111
Northern Pike	8	12.1	1.6	± 1.4	4.6	--	--	--
White Crappie	3	4.5	0.6	± 0.3	5.4	--	--	--
Common Carp	2	3.0	0.4	± 0.5	1.6	--	--	--
Bigmouth Buffalo	1	1.5	0.2	± 0.3	0.4	--	--	--
Channel Catfish	1	1.5	0.2	± 0.3	0.0	--	--	--

* 5 years (1996, 1998, 2000, 2002, 2004)

Black Crappie

Management objective: Maintain a crappie fishery with a trap-net CPUE of at least 20 and a PSD of at least 40.

Black crappies first appeared from an unknown source in 2002 (Table 2) and have replaced the white crappie population. Black crappies up to six years old were sampled and growth exceeded statewide, regional and small lakes and impoundments means (Table 3). Although CPUE is below the management objective, fish ranging in length from 14-32 cm (5.5-12.6 inches) were sampled (Figure 1).

Table 2. Black crappie trap-net CPUE, PSD, RSD-P, and mean Wr for Ethan Dam, Hanson County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CPUE		--		--		19.6		7.4		3.4
PSD		--		--		43		64		47
RSD-P		--		--		3		61		24
Mean Wr		--		--		130		113		111

Table 3. Average back-calculated lengths (mm) for each age class of black crappie in Ethan Dam, Hanson County, 2006.

			Back-calculation Age							
Year Class	Age	N	1	2	3	4	5	6	7	8
2005	1	6	91							
2004	2	3	58	96						
2003	3	4	62	126	188					
2002	4	1	60	114	209	249				
2001	5	2	78	190	253	286	307			
2000	6	1	84	191	217	261	301	319		
All Classes		17	72	144	217	265	304	319		
Statewide Mean			83	147	195	229	249			
Region III Mean			95	167	219	253	274			
SLI* Mean			78	134	180	209	226			

*Small Lakes and Impoundments (<150 acres)

Northern Pike

Ethan Dam supports a low density northern pike population sustained by sporadic natural reproduction (Table 4). The fish sampled in 2006 ranged in length from 536-879 mm (21-35 in) (Figure 2).

Table 4. Northern pike trap-net CPUE, PSD, RSD-P, and mean Wr for Ethan Dam, Hanson County, 1998-2006.

	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	3.9		1.4		11.6		1.6		1.6	4.6
PSD	79		86		23		88		100	61
RSD-P	8		57		6		63		25	28
Mean Wr	94		88		82		85		87	88

*5 years (1996, 1998, 2000, 2002, 2004)

Black Bullhead

Black bullhead trap-net CPUE has decreased dramatically from the 10-year high seen in 1998 (Table 5). The size structure of the population is improving with fish ranging in length from 11-25 cm (4.6-9.9 in) (Figure 3).

Table 5. Black bullhead trap-net CPUE, PSD, RSD-P, and mean Wr for Ethan Dam, Hanson County, 1998-2006.

	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	728.5		149.7		62.6		27.2		6.8	242.8
PSD	1		0		0		0		24	5
RSD-P	0		0		0		0		0	0
Mean Wr	89		75		77		69		74	77

*5 years (1996, 1998, 2000, 2002, 2004)

All Species

Ethan dam has very little species diversity and very low abundance of most species (Table 6).

Table 6. Trap-net CPUE for all fish species sampled in Ethan Dam, Hanson County, 1997-2006.

Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
FCF		--		0.1		--		--		--
CCF		--		--		--		--		0.2
LMB		--		--		0.3		--		--
NOP		3.9		1.4		11.6		1.6		1.6
GSF		0.1		--		--		--		--
WHC		19.9		0.5		--		--		0.6
BLC		--		--		19.6		7.4		3.4
BLB		728.5		149.7		62.6		27.2		6.8
BIB		0.3		0.2		0.4		0.4		0.2
COC		0.1		0.1		3.0		1.2		0.4

FCF (Flathead Catfish), CCF (Channel Catfish), LMB (Largemouth Bass), NOP (Northern Pike), GSF (Green Sunfish), WHC (White Crappie), BLC (Black Crappie), BLB (Black Bullhead), BIB (Bigmouth Buffalo), COC (Common Carp).

MANAGEMENT RECOMMENDATIONS

1. Ethan Dam needs a major renovation to make future fisheries management efforts worthwhile. The lake is too shallow to support a quality fishery. The dam needs to be breached and the silt build-up removed to deepen the lake. Watershed work to reduce sediment flows needs to be done at the same time. (From the 1996 survey report)

Table 7. Stocking record for Ethan Dam, Hanson County, 1990-2006.

Year	Number	Species	Size
1990	4,250	Largemouth Bass	Fingerling
1993	4,250	Largemouth Bass	Sml. Fingerling

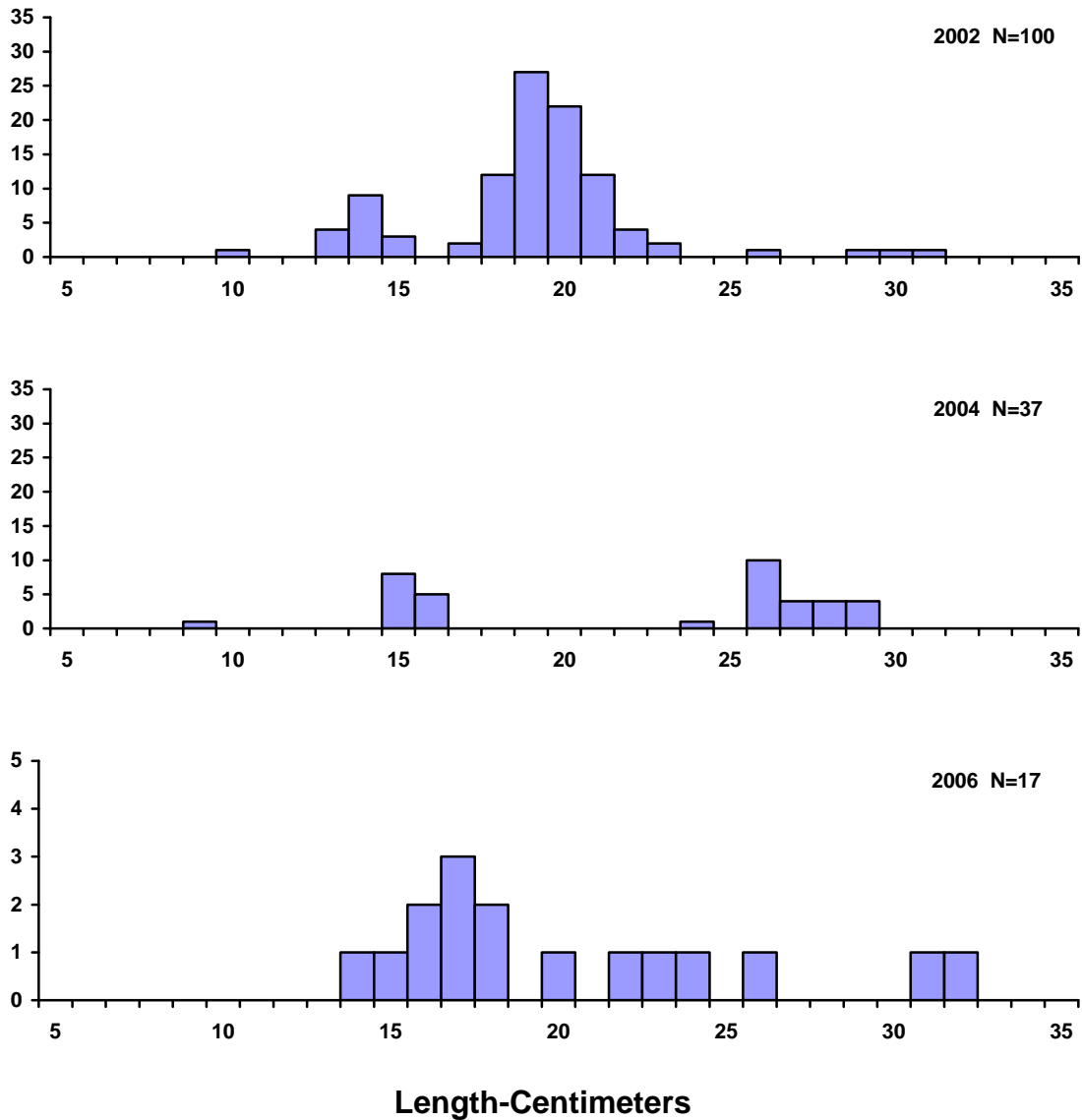


Figure 1. Length frequency histograms for black crappie sampled with trap nets in Ethan Dam, Hanson County in 2002, 2004 and 2006.

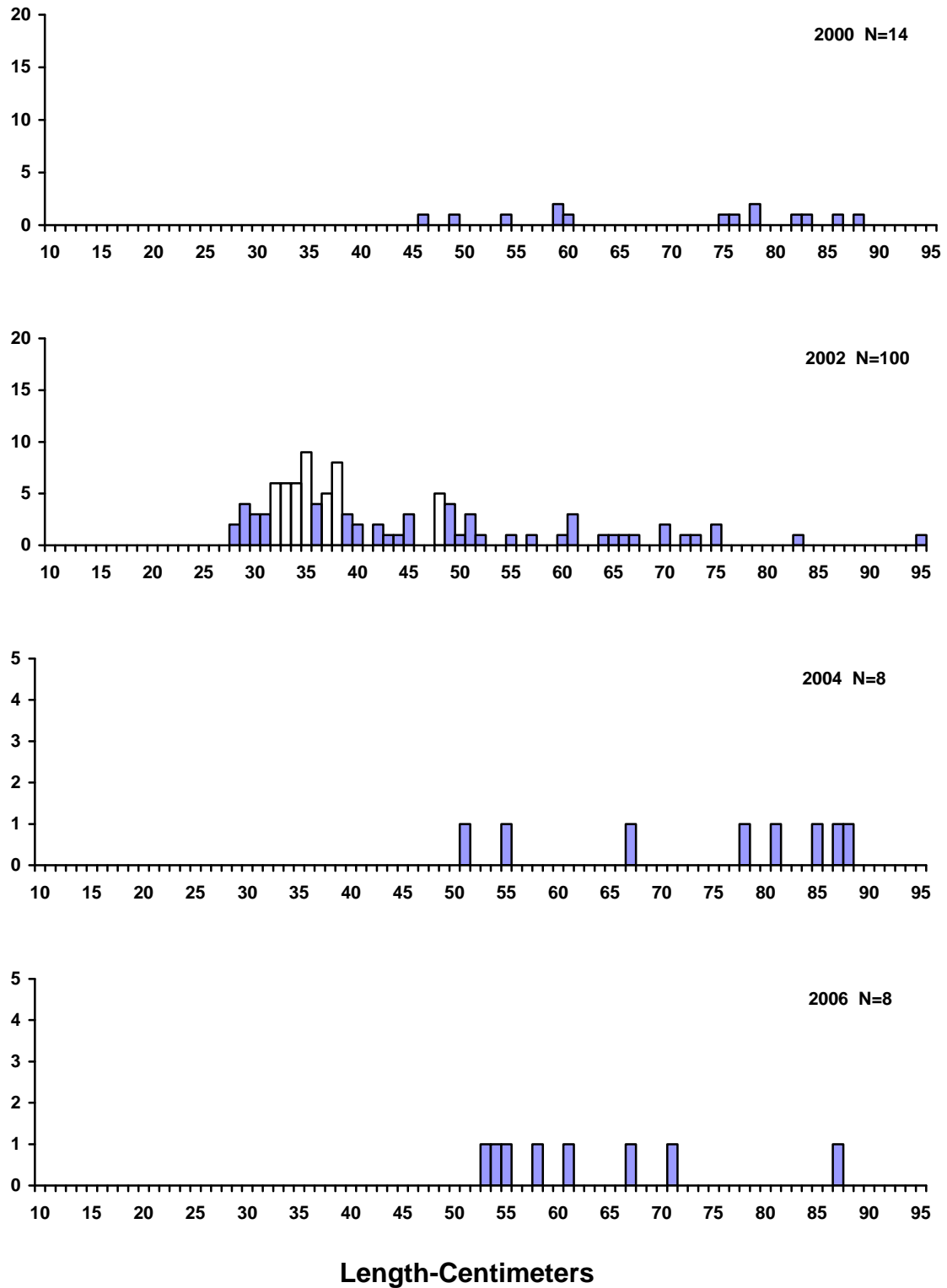


Figure 2. Length frequency histograms for northern pike sampled with trap nets in Ethan Dam, Hanson County in 2000, 2002, 2004 and 2006.

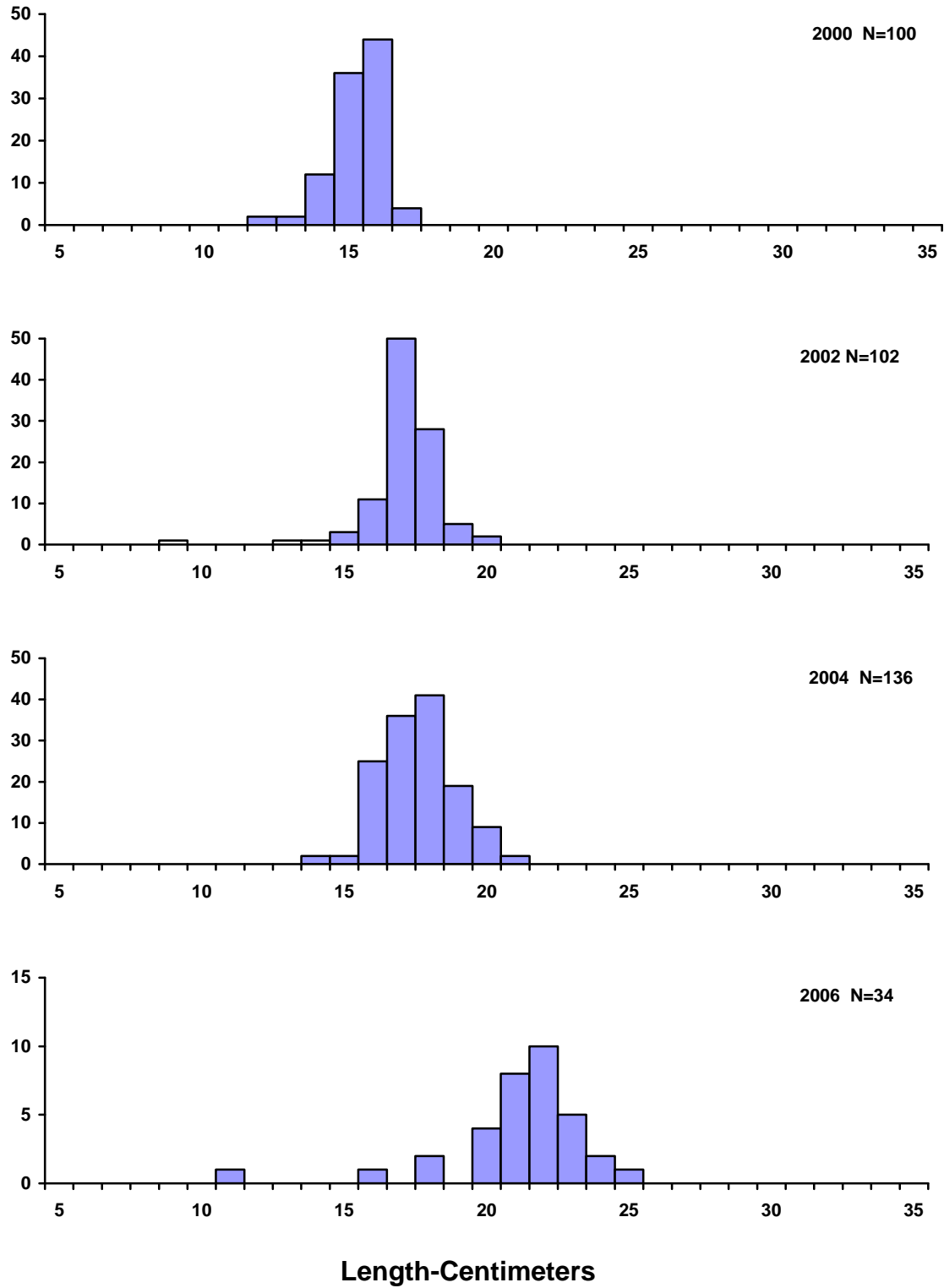
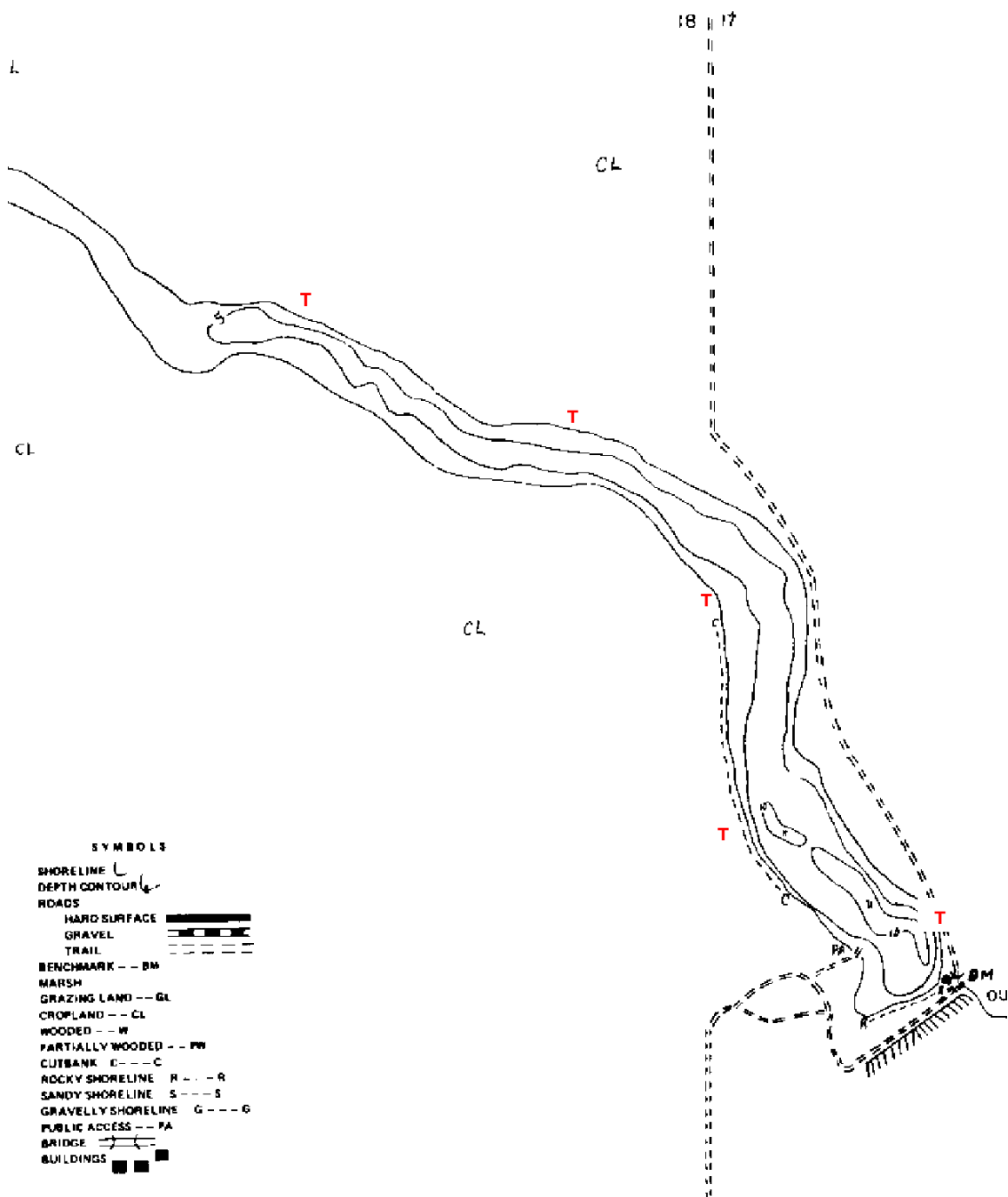


Figure 3. Length frequency histograms for black bullheads sampled with trap nets in Ethan Dam, Hanson County in 2000, 2002, 2004 and 2006.



Legend Trap Net: T

Figure 4. Sampling locations on Ethan Dam, Hanson County, 2006.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-39

Name: Lake Hanson

County: Hanson

Legal Description: T102-R58-Sec. 21

Location from nearest town: 2 miles south of Alexandria, SD

Dates of present survey: August 14-16, 2006; June 13, 2006 (electrofishing)

Date last surveyed: August 16-17, 2004; June 8, 2004 (electrofishing)

Primary Game Species	Other Species
Largemouth Bass	Walleye
Bluegill	Channel Catfish
White Crappie	Black Bullhead
Black Crappie	Hybrid Sunfish

PHYSICAL DATA

Surface Area: 55 acres

Watershed area: 40,053 acres

Maximum depth: 17 feet

Mean depth: 8 feet

Volume: 418 acre-feet

Shoreline length: 2.2 miles

Contour map available: yes

Date mapped: 1970

Lake elevation observed during the survey: 1 foot low due to dredging

Beneficial use classifications: (5) warmwater semipermanent fish propagation, (7) immersion recreation, (8) limited-contact recreation and (9) fish and wildlife propagation and stock watering.

Ownership of the Lake and Adjacent Lakeshore Property

Lake Hanson is an artificial impoundment constructed by the WPA in 1934. The South Dakota Department of Game, Fish, and Parks (GFP) manages the fishery. Two easements created in 1934 allow public access to a strip of land lying 12 feet above the ordinary high water mark around the entire lake.

Fishing Access

There is a concrete-plank boat ramp on the northwest corner of the lake capable of handling most boats. Shore fishing is available at various sites along the north shore.

Field Observations of Water Quality and Aquatic Vegetation

Water clarity at the time of the survey was good with a Secchi depth measurement of 46 cm (18 in). Common cattail (*Typha spp.*) was found around most of the south shoreline.

BIOLOGICAL DATA

Methods:

Lake Hanson was sampled on August 14-16, 2006 with nine overnight trap-net sets. The trap nets are constructed with 19-mm-bar-mesh ($\frac{3}{4}$ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. One hour and twenty minutes of nighttime electrofishing was done on June 13, 2006 to sample the largemouth bass population. Sampling locations are displayed in Figure 5.

Results and Discussion:

Trap Net Catch

Black crappie (49.3%), bluegill (24.3%), and yellow perch (23.9%) comprised the majority of the trap net catch (Table 1). Other species sampled included white crappie, channel catfish, northern pike, and common carp.

Table 1. Total catch from nine overnight trap net sets at Lake Hanson, Hanson County August 14-16, 2006.

Species	Number	Percent	CPUE ¹	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Crappie	668	49.3	74.2	± 19.7	32.2	14	5	99
Bluegill	329	24.3	36.6	± 12.7	51.9	45	12	96
Yellow Perch	323	23.9	35.9	± 38.9	0.7	7	0	83
White Crappie	22	1.6	2.4	± 0.9	59.1	68	64	89
Channel Catfish	7	0.5	0.8	± 0.4	0.7	--	--	--
Northern Pike	4	0.3	0.4	± 0.4	0.6	--	--	--
Common Carp	1	0.1	0.1	± 0.1	0.2	--	--	--

* 3 years (1996, 2002, 2004)

Bluegill

Management objective: Maintain a bluegill fishery with a trap net CPUE of at least 20 and RSD-18 of at least 20.

Bluegill trap-net CPUE (Table 1) exceeded the management objective while RSD-18 did not (Table 2). The bluegills sampled ranged in length from 8 - 20 cm (3.1-7.9 in) (Figure 1) and growth was slower than statewide, regional, and small lakes and impoundments means (Table 3). Lake Hanson bluegills, black crappies and yellow perch share similar characteristics of consistent recruitment and slow growth.

Table 2. Bluegill trap-net CPUE, PSD, RSD-18, RSD-P, and mean Wr for Lake Hanson, Hanson County, 1998-2006.

¹ See Appendix A for definitions of CPUE, PSD, RSD-P and mean Wr.

	1998	1999	2000	2001	2002	2003	2004	2005	2006
CPUE					8.9		89.6		36.6
PSD					64		12		45
RSD-18					18		2		16
RSD-P					6		1		12
Mean Wr					112		88		96

Table 3. Average back-calculated lengths (mm) for each age class of bluegill in Lake Hanson, Hanson County, 2006.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2005	1	104	57							
2004	2	34	43	98						
2003	3	21	45	98	149					
2002	4	44	49	95	127	163				
2001	5	82	48	91	121	139	167			
All Classes		285	51	94	127	147	167			
Statewide Mean			55	103	141	166	180			
Region III Mean			60	116	157	180	190			
SLI* Mean			53	101	138	163	180			

*Small Lakes and Impoundments (<150 acres)

White Crappie

Management objective: Maintain a crappie fishery with a trap net CPUE of at least 20 and PSD of at least 40

White crappie trap-net CPUE decreased in 2006 (Table 4). The crappies sampled ranged in length from 161-281 mm (6.3-11.1 in) (Figure 2) and growth is typically slower than statewide, regional and small impoundment means (Table 5). However, growth of age 2+ crappies this year was faster than that reported in 2005 and may be related to decreased abundance.

Table 4. White crappie trap-net CPUE, PSD, RSD-P, and mean Wr for Lake Hanson, Hanson County, 1998-2006.

	1998	1999	2000	2001	2002	2003	2004	2005	2006
CPUE					4.3		27.2		2.4
PSD					98		19		68
RSD-P					37		4		64
Mean Wr					106		87		89

Table 5. Average back-calculated lengths (mm) for each age class of white crappie in Lake Hanson, Hanson County, 2006.

Back-calculation Age										
Year Class	Age	N	1	2	3	4	5	6	7	8
2005	1	8	88							
2004	2	1	75	194						
2003	3	13	74	135	242					
All Classes		22	79	139	242					
Statewide Mean			93	183	221	252	275			
Region III Mean			93	185	225	259	284			
SLI* Mean			95	177	209	237	251			

*Small Lakes and Impoundments (<150 acres)

Black Crappie

Management objective: Maintain a crappie fishery with a trap net CPUE of at least 20 and PSD of at least 40.

The 2006 black crappie trap-net CPUE was the highest observed in ten years (Table 6). The crappies sampled ranged in length from 134–280 mm (5.3– 11.0 in.) (Figure 1) with a mean of 166 mm (6.5 in). Growth was similar to statewide and regional means (Table 7), however only age-1 and age-3 fish were sampled.

Table 6. Black crappie trap-net CPUE, PSD, RSD-P, and mean Wr for Lake Hanson, Hanson County, 1998-2006.

	1998	1999	2000	2001	2002	2003	2004	2005	2006
CPUE					16.7		66.0		74.2
PSD					95		4		14
RSD-P					9		0		5
Mean Wr					105		111		99

Table 7. Average back-calculated lengths (mm) for each age class of black crappie in Lake Hanson, Hanson County, 2006.

Back-calculation Age										
Year Class	Age	N	1	2	3	4	5	6	7	8
2005	1	576	91							
2003	3	92	83	151	226					
All Classes		668	87	151	226					
Statewide Mean			83	147	195	229	249			
Region III Mean			95	167	219	253	274			
SLI* Mean			78	134	180	209	226			

*Small Lakes and Impoundments (<150 acres)

Largemouth Bass

Management objective: Maintain a largemouth bass fishery with an electrofishing catch per hour (CPH) of at least 20 and RSD-P range of 20-40.

The largemouth bass electrofishing CPUE of 9.0 was well below our management objective (Table 8). The population was heavily skewed towards larger fish (294-449 mm or 11.6-17.7 in) reflecting the lack of natural reproduction and poor survival of fingerlings stocked in 2002.

Largemouth bass growth was similar to statewide and small impoundment means (Table 10) and condition was excellent with a mean Wr of 104.

Largemouth bass should be stocked as yearlings or older to maintain abundance in Lake Hanson and other Region III small impoundments. The 381 mm minimum size limit currently protects only an estimated 25% of the population, although the high abundance of large fish relative to smaller ones suggests that exploitation is not a problem.

Table 8. Total catch from one hour and twenty minutes of nighttime electrofishing on Lake Hanson, Hanson County, June 13, 2006.

Species	Number	Percent	CPUE	Mean CPUE*	PSD	RSD-P	Mean Wr
Largemouth Bass	12	100	9.0	21.5	92	75	104

* Two years (2000,2004).

Table 9. Largemouth bass electrofishing CPUE, PSD, RSD-P, and mean Wr for Lake Hanson, Hanson County, 1998-2006.

	1998	1999	2000	2001	2002	2003	2004	2005	2006
CPUE			6.2				36.8		9.0
PSD			63				67		92
RSD-P			38				28		75
Mean Wr			101				106		104

Table 10. Average back-calculated lengths (mm) for each age class of largemouth bass in Lake Hanson, Hanson County, 2006.

Back-calculation Age												
Year Class	Age	N	1	2	3	4	5	6	7	8	9	10
2003	3	1	85	257	281							
2001	5	2	119	188	305	378	408					

2000	6	4	92	170	237	292	352	387		
1999	7	3	97	182	252	300	363	397	415	
1998	8	1	99	178	214	280	338	374	417	444
1997	9	1	86	173	226	243	264	292	335	360
All Classes	12	96	192	252	298	345	363	389	402	371
Statewide Mean			96	182	250	305	342			
Region III Mean			111	212	287	347	383			
SLI* Mean			99	183	246	299	332			

*Small Lakes and Impoundments (<150 acres)

All Species

Saugeye, walleye, green sunfish and have not been sampled since 2000 (Table 11). Rough fish are at a low level of abundance. Four panfish species are present, three in relatively high abundance.

Table 11. Electrofishing (EF) and trap-net (TN) CPUE for all fish species sampled in Lake Hanson, Hanson County, 1997-2006.

Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CCF (EF)				2.3		--		--		--
CCF (TN)				--		--		--		0.8
LMB (EF)				6.2		--		36.8		9.0
LMB (TN)				--		--		0.2		--
NOP (TN)				--		0.8		0.4		0.4
SXW (EF)				8.5		--		--		--
WAE (EF)				43.1		--		--		--
WAE (TN)				--		0.7		--		--
BLC (EF)				41.5		--		--		--
BLC (TN)				--		16.7		66.0		74.2
BLG (EF)				76.9		--		--		--
BLG (TN)				--		8.9		89.6		36.6
GSF (EF)				1.5		--		--		--
GSF (TN)				--		--		--		--
HYB (TN)				--		0.1		--		--
WHC (EF)				50.8		--		--		--
WHC (TN)				--		4.3		27.2		2.4
YEP (TN)				--		0.7		1.2		35.9
BLB (EF)				5.4		--		--		--
BLB (TN)				--		0.6		0.4		--
COC (EF)				17.7		--		--		--
COC (TN)				--		--		--		0.1

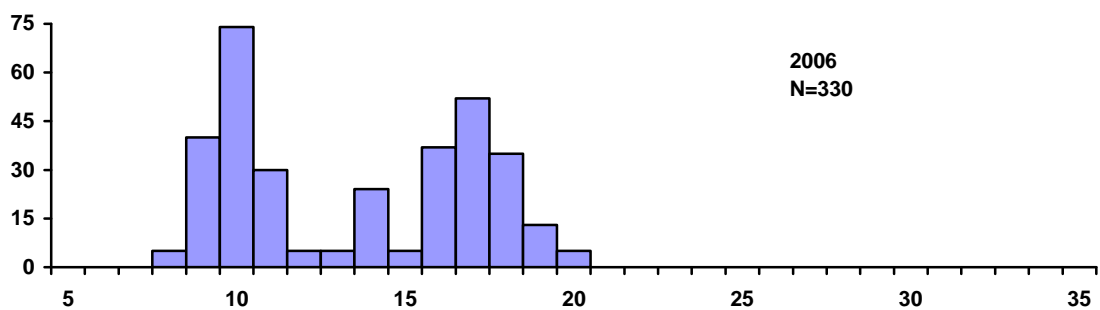
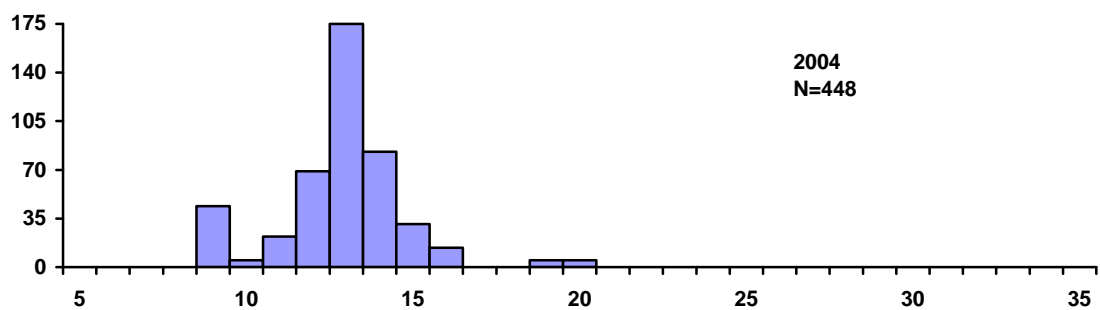
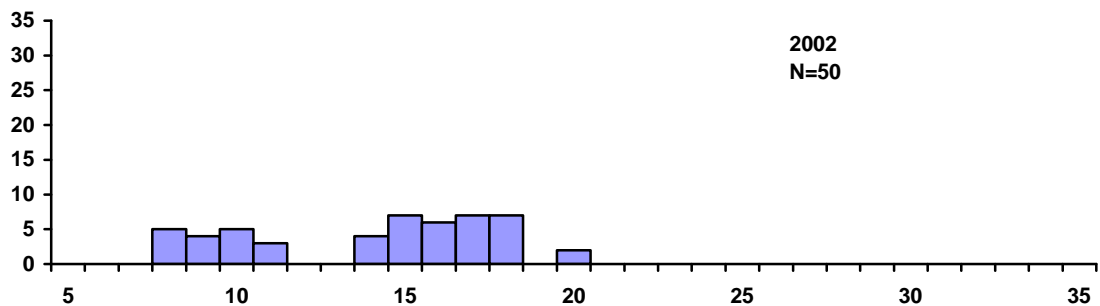
CCF (Channel Catfish), LMB (Largemouth Bass), NOP (Northern Pike), SXW (Saugeye), WAE (Walleye), BLC (Black Crappie), BLG (Bluegill), GSF (Green Sunfish), HYB (Hybrid Sunfish), WHC (White Crappie), YEP (Yellow Perch), BLB (Black Bullhead), COC (Common Carp),

MANAGEMENT RECOMMENDATIONS

1. Stock adult or yearling bass as needed to maintain largemouth bass electrofishing CPUE at or above 20.0 per hour
2. Continue to monitor the fish populations every other year by netting and electrofishing surveys.

Table 12. Stocking record for Lake Hanson, Hanson County, 1990-2006.

Year	Number	Species	Size
1991	3,100	Largemouth Bass	Fingerling
1996	1,336	Walleye	Lrg. Fingerling
1997	1,375	Saugeye	Fingerling
	1,375	Walleye	Fingerling
1998	801	Saugeye	Fingerling
	1,335	Walleye	Fingerling
1999	637	Saugeye	Lrg. Fingerling
	1,375	Walleye	Fingerling
2002	2,000	Largemouth Bass	Fingerling



Length-Centimeters

Figure 1. Length frequency histograms for bluegills sampled with trap nets in Lake, Hanson, Hanson County, 2002, 2004, 2006.

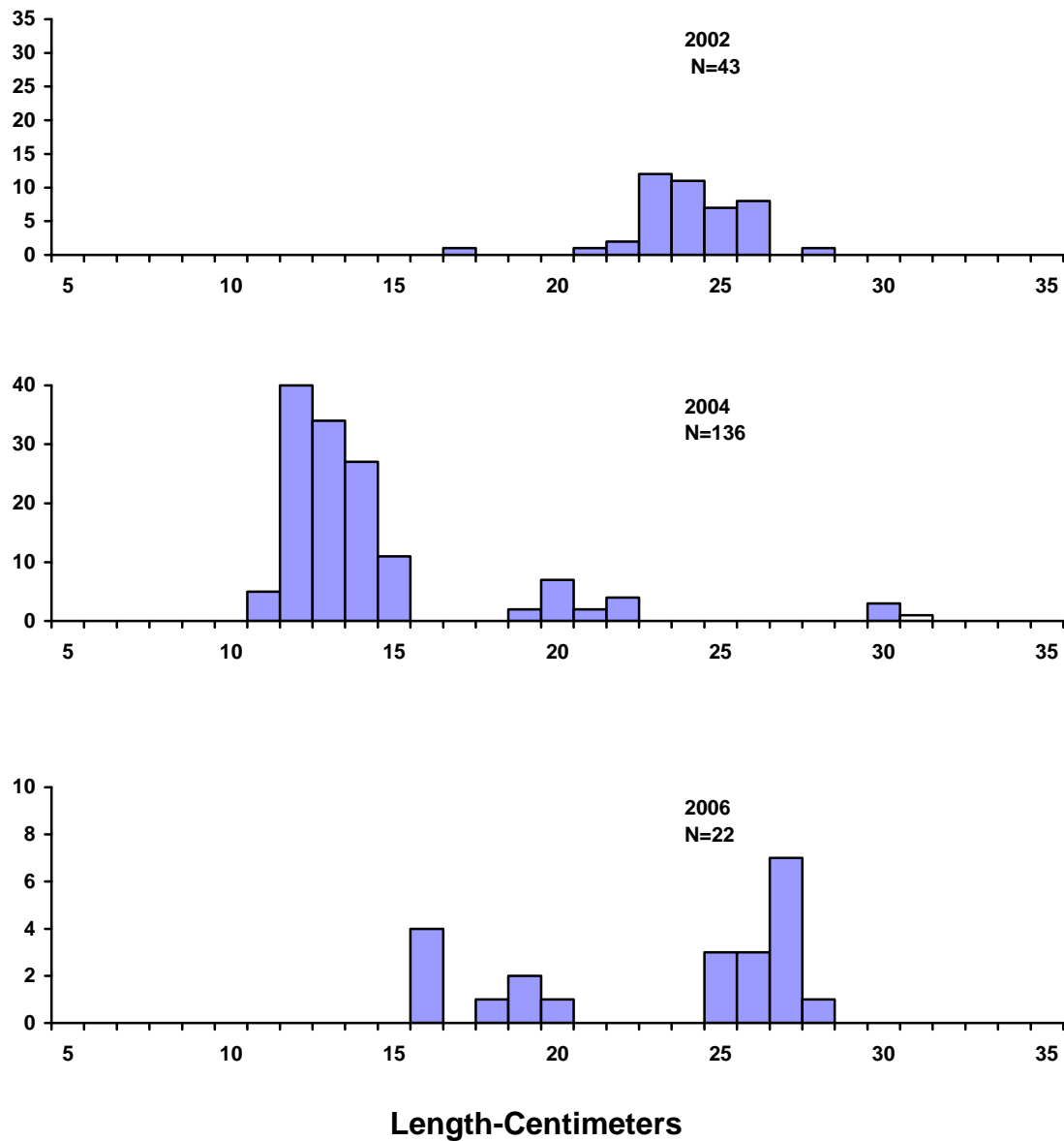


Figure 2. Length frequency histograms for white crappies sampled with trap nets in Lake, Hanson, Hanson County, 2002, 2004, 2006.

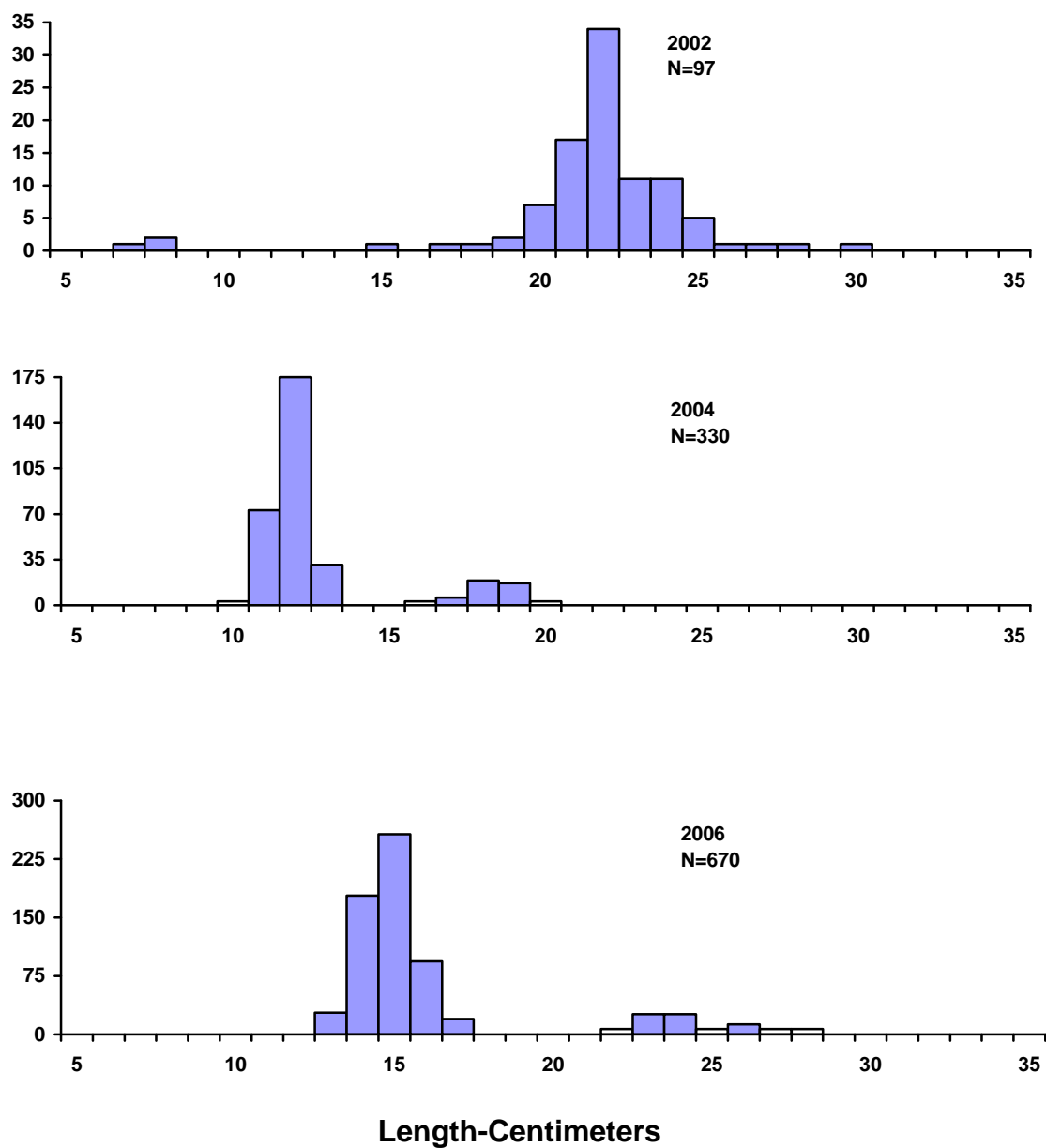


Figure 3. Length frequency histograms for black crappies sampled with trap nets in Lake, Hanson, Hanson County, 2002, 2004, 2006.

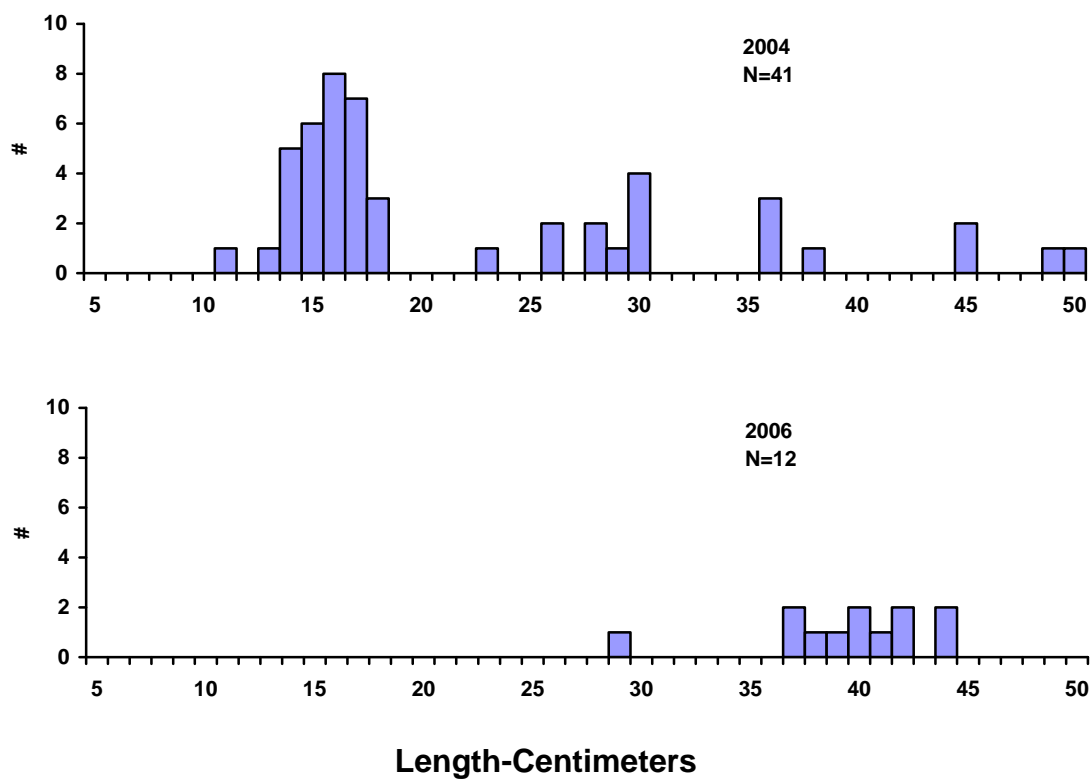
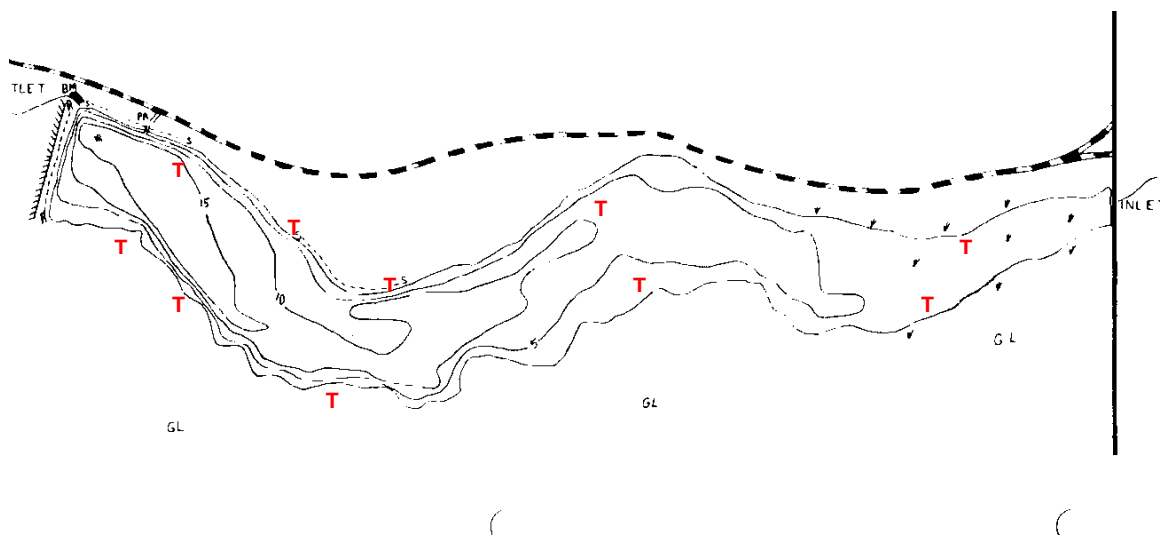


Figure 4. Length frequency histograms for largemouth bass sampled by electrofishing in Lake Hanson, Hanson County, 2004 and 2006.



Legend

Trap Net Sites: T

Figure 5. Sampling locations on Lake Hansen, Hansen County, 2006.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
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For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-39

Name: Dimock Lake **County:** Hutchinson

Legal Description: T100N-R60W-Sec. 15

Location from nearest town: 3 miles east of Dimock, SD

Dates of present survey: August 14-16, 2006 (netting); June 7, 2006 (electrofishing)

Date last surveyed: August 16-17, 2004 (netting); June 13-14, 2004 (electrofishing)

Primary Game and Forage Species	Secondary and Other Species
Largemouth Bass	Channel Catfish
Black Crappie	Yellow Perch
White Crappie	Black Bullhead
Bluegill	Common Carp
	Northern Pike
	Walleye
	Green Sunfish

PHYSICAL DATA

Surface Area: 148 acres

Maximum depth: 18 feet

Volume: 847 acre-feet

Contour map available: Yes

OHWM elevation: None set

Outlet elevation: None set

Lake elevation observed during the survey: 1.5 feet low

Beneficial use classifications: (5) warmwater semi-permanent fish propagation, (7) immersion recreation, (8) limited-contact recreation and (9) fish and wildlife propagation and stock watering.

Watershed: 25,600 acres

Mean depth: 5.7 feet

Shoreline length: 5.3 miles

Date mapped: 1994

Date set: NA

Date set: NA

Introduction

Dimock Lake was named for the nearby town of Dimock, South Dakota. The original dam was built by the Works Progress Administration in 1936. The dam was washed out in 1984 following near record precipitation in the watershed. Construction on a new dam was finished in January, 1993. The lake completely refilled in February, 1993 and fish stocking started later that spring.

Ownership of Lake and Adjacent Lakeshore Properties

Dimock Lake is owned and managed by the South Dakota Department of Game, Fish and Parks (GFP). There is a fifteen-foot easement above the high water mark around the entire lake for public access.

Fishing Access

The Dimock Lake Access Area has a single lane boat ramp, dock, picnic shelter, and public toilet. There are several areas suitable for shore fishing.

Field Observations of Water Quality and Aquatic Vegetation

The water in Dimock Lake was turbid during the survey with a Secchi depth measurement of 38 cm (15 in). No submerged aquatic vegetation was visible but there are still large numbers of flooded trees in the lake. Cattails (*Typha spp.*) were present in shallow areas.

BIOLOGICAL DATA

Methods:

Dimock Lake was sampled on August 14-16, 2006 with ten overnight trap net sets. The trap nets are constructed with 19-mm-bar-mesh ($\frac{3}{4}$ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. Five twenty-minute sites of nighttime electrofishing were done on June 7, 2006 to sample the largemouth bass population. Trap-net and electrofishing sites are displayed in Figure 5.

Results and Discussion:

Trap Net Catch

Black bullhead (56.9%) and black crappie (22.6%) were the most common species sampled in the trap nets (Table 1). Other species sampled included bluegill, white crappie, channel catfish, yellow perch, hybrid sunfish, green sunfish, common carp, and largemouth bass.

Table 1. Total catch from ten overnight trap net sets at Dimock Lake, Hutchinson County, August 14-16, 2006.

Species	Number	Percent	CPUE ¹	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	976	56.9	97.6	± 37.7	176.7	0	0	70
Black Crappie	388	22.6	38.8	± 21.0	34.8	13	0	93
Bluegill	129	7.5	12.9	± 6.0	5.7	12	1	102
White Crappie	80	4.7	8.0	± 3.2	12.1	14	3	93
Channel Catfish	69	4.0	6.9	± 3.0	2.9	35	0	88
Yellow Perch	23	1.3	2.3	± 1.0	1.7	39	0	86
Hybrid Sunfish	21	1.2	2.1	± 1.7	0.0	--	--	--
Green Sunfish	18	1.1	1.8	± 0.9	5.8	0	0	97
Common Carp	7	0.4	0.7	± 0.4	5.1	--	--	--
Largemouth Bass	3	0.2	0.3	± 0.3	0.0	--	--	--

* 8 years (1994-1996, 1998-1999, 2000, 2002, 2004)

Largemouth Bass

Management objective: Maintain a largemouth bass fishery with an electrofishing catch per hour (CPH) of at least 20 and RSD-P range of 20-40.

¹ See Appendix A for definitions of CPUE, PSD, RSD-P and mean Wr.

Largemouth bass electrofishing CPH and RSD-P has steadily increased since the partial winterkill in 2000-2001 and currently satisfies our management objectives (Table 2). Growth is above average for South Dakota waters and half of the largemouth bass captured in 2006 were 38 cm (15 inches) or longer (Table 3 and Figure 1). Some natural reproduction has occurred in each of the last three years; however, no large year classes were produced. High turbidity and the absence of aquatic vegetation are the likely cause.

Table 2. CPH, PSD, RSD-P and mean Wr for largemouth bass sampled by electrofishing on Dimock Lake, Hutchinson County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CPUE		33.0		59.5		5.0		7.8		21.6
PSD		95		58		75		46		73
RSD-P		8		17		25		38		50
Mean Wr		96		113		114		102		103

Table 3. Average back-calculated lengths (mm) for each age class of largemouth bass in Dimock Lake, Hutchinson County, 2006.

			Back-calculation Age							
Year Class	Age	N	1	2	3	4	5	6	7	8
2005	1	8	102							
2004	2	8	72	200						
2003	3	1	112	208	253					
2001	5	2	68	138	208	282	336			
2000	6	5	96	193	272	317	362	397		
1999	7	8	91	193	257	304	339	368	391	
1997	9	2	84	184	303	354	404	441	463	486
1996	10	2	63	148	253	316	367	398	427	445
All Classes		36	87	188	260	312	355	389	409	465
Statewide Mean			96	182	250	305	342			
Region III Mean			111	212	287	347	383			
SLI* Mean			99	183	246	299	332			

* Small Lakes and Impoundments

Bluegill

Management objective: Maintain a bluegill fishery with a trap net CPUE of at least 20 and RSD-18 of at least 20.

Bluegill CPUE has gradually increased to levels seen before the partial winterkill (Table 4). However, CPUE and RSD-P still lie below management objectives and most of the bluegills sampled were less than 15 cm (6in.) long (Figure 2). Since bluegills and largemouth bass have similar habitat requirements, the lack of aquatic vegetation and turbid water is likely affecting bluegill abundance as well.

Table 4. Bluegill trap-net CPUE, PSD, RSD-18, RSD-P, and mean Wr for Dimock Lake, Hutchinson County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CPUE		4.4	13.4	9.6		0.1		0.8		12.9
PSD		98	80	93		--		--		12
RSD-18		84	24	67		--		--		1
RSD-P		0	14	5		--		--		1
Mean Wr		117	107	114		--		--		102

Black and White Crappie

Management objective: Maintain a crappie fishery with a trap net CPUE of at least 20 and PSD of at least 40.

Black crappies numbers have declined since 2002 and are now similar to those seen before the partial winterkill (Table 5). Strong year classes from 2001 and 2005 dominate the population (Table 6). Growth is slower than statewide, regional and small lakes and impoundments means and so slow that only 75 mm (3 inches) separate fish that differ in age by four years (Figure 3).

Table 5. Black crappie trap-net CPUE, PSD, RSD-P, and mean Wr for Dimock Lake, Hutchinson County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CPUE		16.3	24.9	52.2		103.9		78.2		38.8
PSD		83	28	78		35		3		13
RSD-P		0	0	18		3		0		0
Mean Wr		120	108	107		98		94		93

Table 6. Average back-calculated lengths (mm) for each age class of black crappie in Dimock Lake, Hutchinson County, 2006.

			Back-calculation Age							
Year Class	Age	N	1	2	3	4	5	6	7	8
2005	1	205	86							

2004	2	11	83	155			
2002	4	24	75	145	172	189	
2001	5	149	86	128	147	164	180
All Classes		389	85	132	150	167	180
Statewide Mean			83	147	195	229	249
Region III Mean			95	167	219	253	274
SLI* Mean			78	134	180	209	226

*Small Lakes and Impoundments (<150 acres)

White crappie trap-net CPUE and PSD increased slightly in 2006 (Table 7). The population is mostly comprised of one, two and five year old fish ranging in length from 110-320 mm (4.3-12.6 in.)(Figure 4). Similar to black crappies, white crappie growth is slower than statewide, regional and small lakes and impoundments means (Table 8).

Table 7. White crappie trap-net CPUE, PSD, RSD-P, and mean Wr for Dimock Lake, Hutchinson County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CPUE		37.9	3.9	17.1		24.4		4.2		8.0
PSD		94	69	80		16		0		14
RSD-P		10	0	39		8		0		3
Mean Wr		110	95	106		97		105		93

Table 8. Average back-calculated lengths (mm) for each age class of white crappie in Dimock Lake, Hutchinson County, 2006.

			Back-calculation Age							
Year Class	Age	N	1	2	3	4	5	6	7	8
2005	1	18	79							
2004	2	29	87	151						
2003	3	2	71	132	172					
2002	4	7	73	138	179	200				
2001	5	17	91	136	158	176	189			
2000	6	1	58	92	151	176	194	208		
1999	7	2	67	101	149	163	174	183	190	
All Classes		76	83	142	163	181	188	191	190	
Statewide Mean			93	183	221	252	275			
Region III Mean			93	185	225	259	284			
SLI* Mean			95	177	209	237	251			

*Small Lakes and Impoundments (<150 acres)

All Species

Black bullheads and black crappies have consistently been the most abundant species found in Dimock Lake while the abundance of predator species remains consistently low (Table 9). The stocking of 324 adult channel catfish in 2005 and 2006 increased CPUE slightly (Table 9 & 10).

Table 9. Electrofishing (EF), and trap-net (TN) CPUE for all fish species sampled in Dimock Lake, Hutchinson County, 1997-2006.

Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CCF (TN)		2.2	3.7	1.9		1.9		4.8		6.9
LMB (EF)		33.0	--	59.5		5.0		7.8		21.6
LMB (TN)		--	0.1	0.1		--		--		0.3
NOP (TN)		--	--	0.1		0.6		0.2		--
WAE (TN)		0.1	0.1	--		--		0.2		--
BLC (TN)		16.3	24.9	52.2		103.9		78.2		38.8
BLG (TN)		4.4	13.4	9.6		0.1		0.8		12.9
GSF (TN)		3.0	0.3	--		0.2		0.6		1.8
HYB (TN)		--	--	--		--		--		2.1
WHC (TN)		37.9	3.9	17.1		24.4		4.2		8.0
YEP (TN)		0.7	0.3	0.2		2.6		0.4		2.3
BLB (TN)		405.0	40.9	22.8		510.7		120.6		97.6
COC (TN)		4.5	2.3	1.8		2.1		4.4		0.7

CCF (Channel Catfish), LMB (Largemouth Bass), NOP (Northern Pike), WAE (Walleye), BLC (Black Crappie), BLG (Bluegill), GSF (Green Sunfish), HYB (Hybrid Sunfish), WHC (White Crappie), YEP (Yellow Perch), BLB (Black Bullhead), COC (Common Carp),

MANAGEMENT RECOMMENDATIONS

1. Stock adult largemouth bass, when available, to supplement the population.
2. Stock adult channel catfish to provide additional angling opportunity.
3. Continue to conduct lake surveys, including electrofishing, every other year to monitor the fishery.
4. Investigate opportunities to improve water quality.
5. Consider the possibility of using a drawdown to expose a portion of the lake bottom and evaluate the effects. Exposure should help compact and aerate sediments and promote the growth of aquatic vegetation.

Table 10. Stocking record for Dimock Lake, Hutchinson County, 1990-2006.

Year	Number	Species	Size
1993	54,450	Channel Catfish	Fingerling
	8,840	Largemouth Bass	Sml. Fingerling
	687	Yellow Perch	Adult
1994	2,100	Channel Catfish	Fingerling
	7,500	Largemouth Bass	Med. Fingerling
	2,339	Walleye	Lrg. Fingerling
	31	Walleye	Adult
	8,326	White Crappie	Fingerling
1996	7,500	Channel Catfish	Fingerling
	6,500	Largemouth Bass	Fingerling
	1,875	Walleye	Fingerling
	748	Yellow Perch	Adult
1998	741	White Crappie	Adult
1999	750	White Crappie	Adult
2000	1,096	Black Crappie	Adult
2001	7,500	Largemouth Bass	Fingerling
2005	174	Channel Catfish	Adult
2006	150	Channel Catfish	Adult

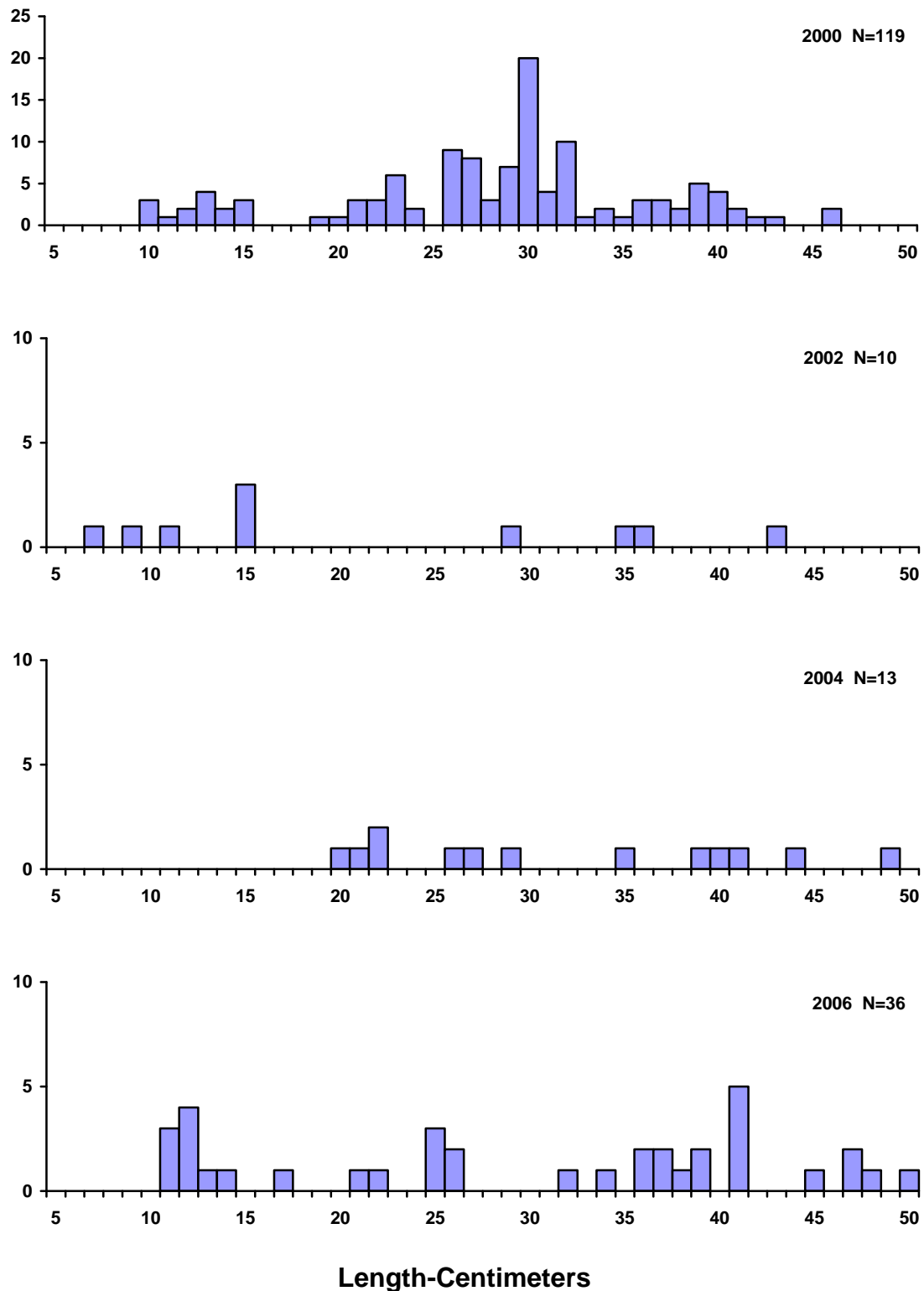


Figure 1. Length frequency histograms for largemouth bass sampled by electrofishing in Dimock Lake, Hutchinson County, 1998, 2000, 2002, and 2004.

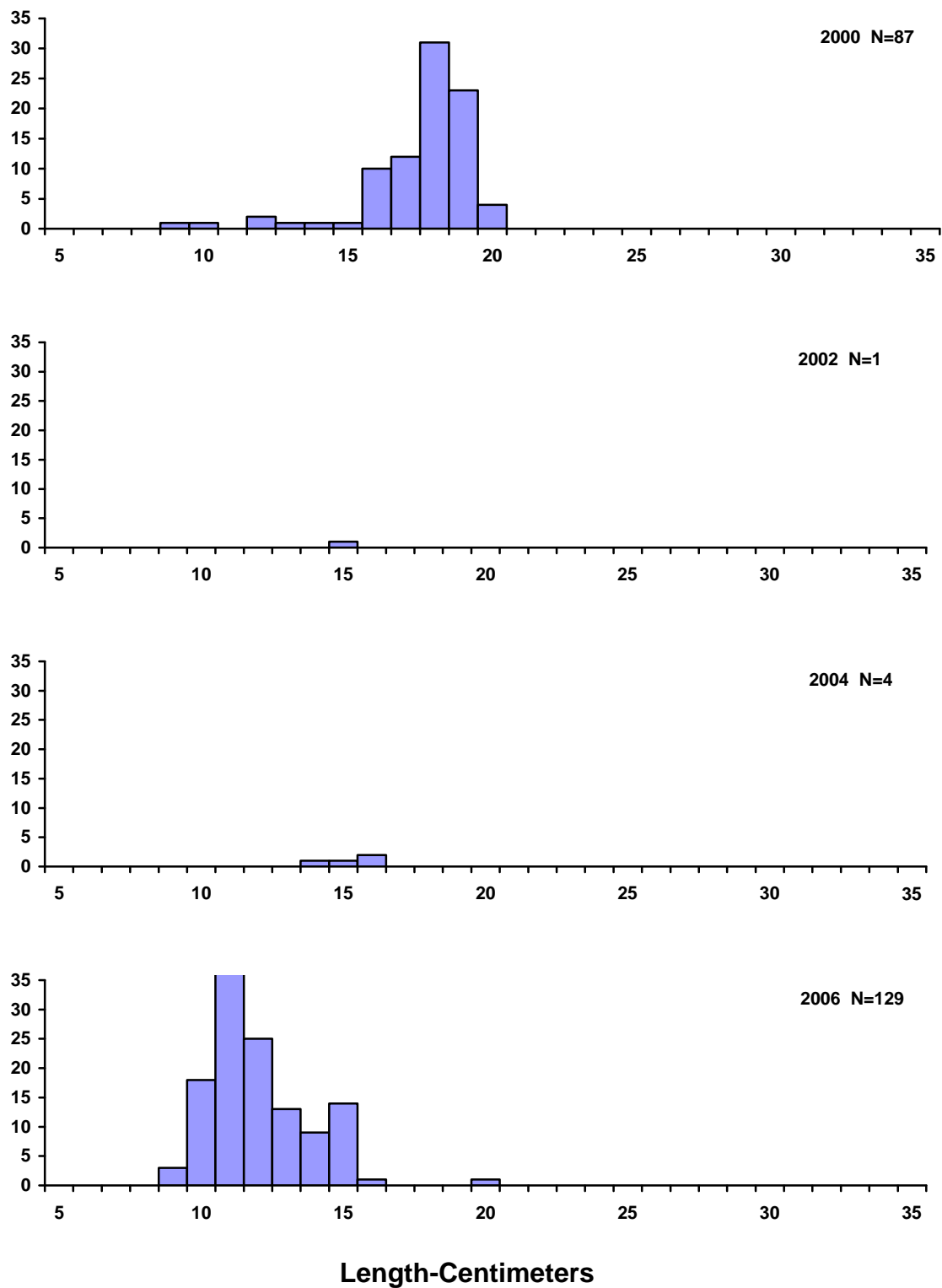


Figure 2. Length frequency histograms for bluegill sampled with trap nets in Dimock Lake, Hutchinson County, 2000, 2002, 2004 and 2006.

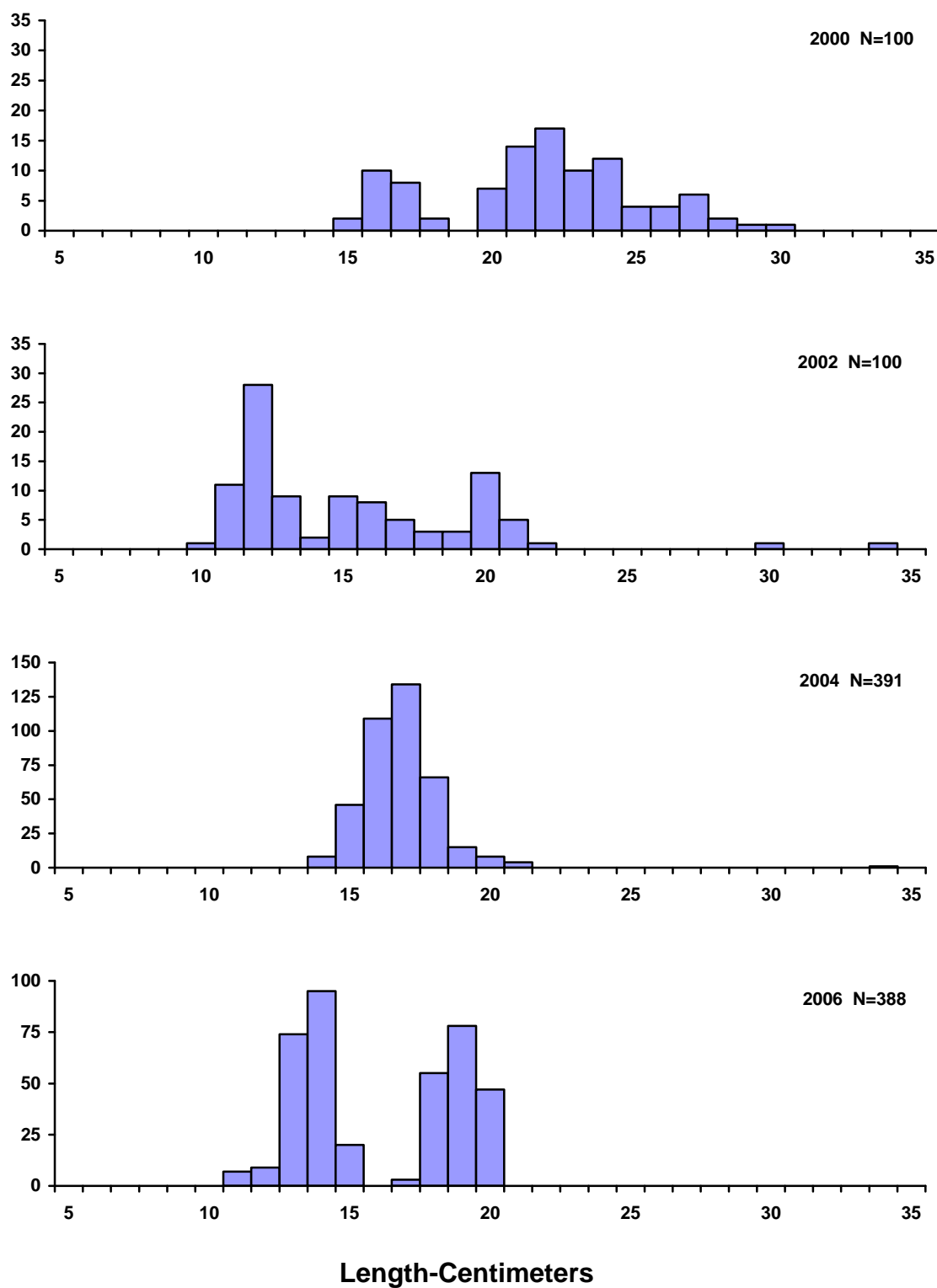


Figure 3. Length frequency histograms for black crappie sampled with trap nets in Dimock Lake, Hutchinson County, 2000, 2002, 2004 and 2006.

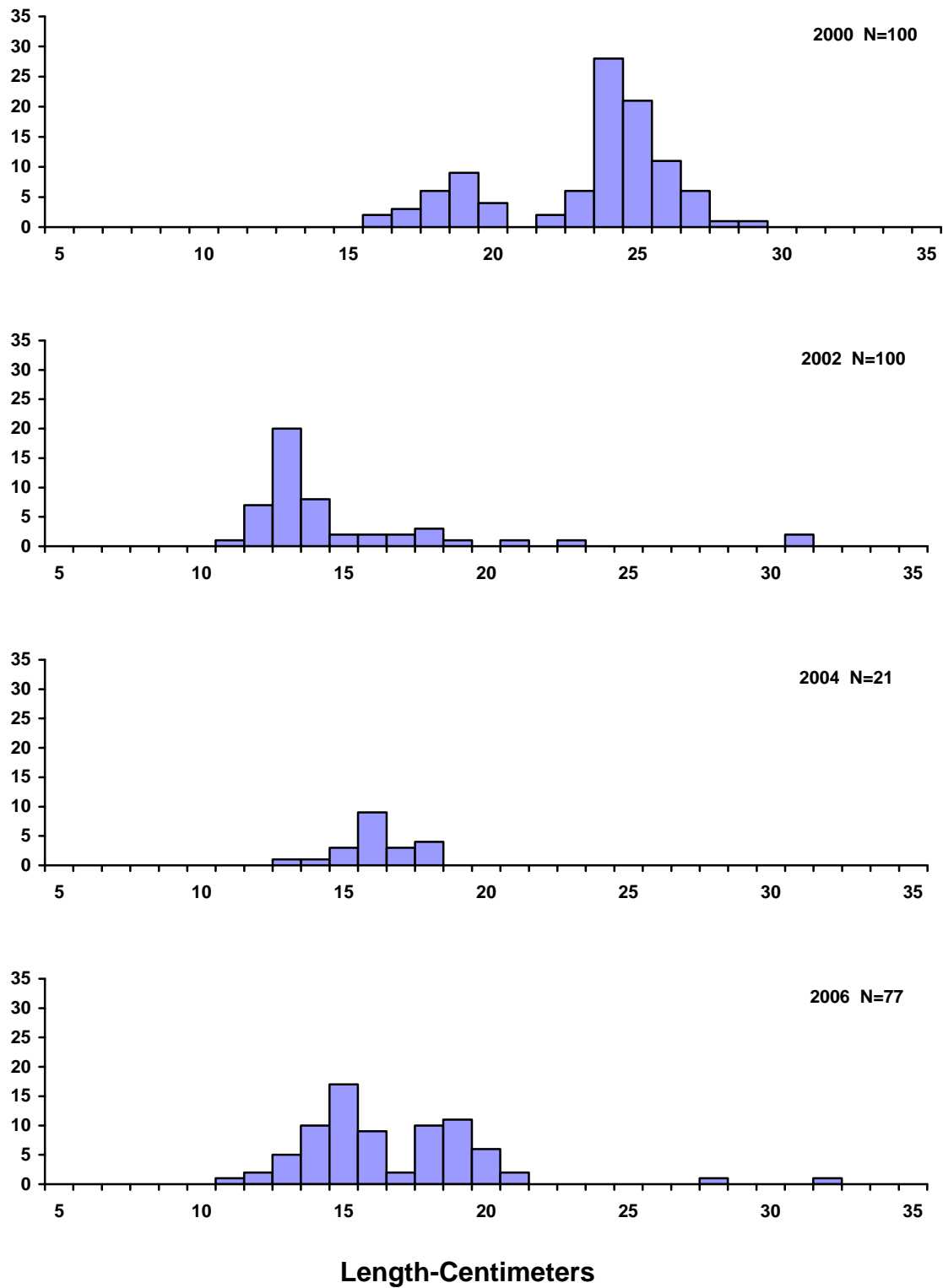
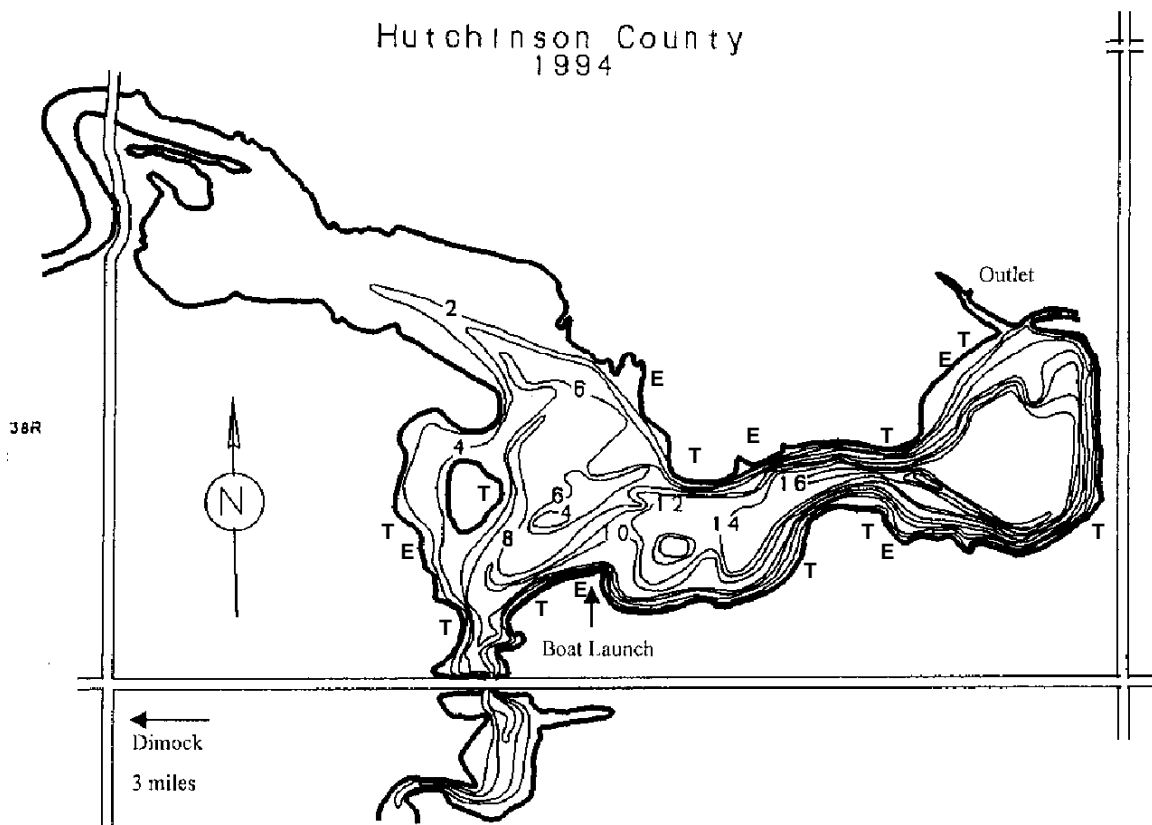


Figure 4. Length frequency histograms for white crappies sampled with trap nets in Dimock Lake, Hutchinson County, 2000, 2002, 2004 and 2006.

South Dakota Department of Game, Fish and Parks

Dimock Lake

Hutchinson County
1994



Legend Trap Net Sites: T
Electrofishing Sites: E

Figure 5. Sampling sites on Dimock Lake, Hutchinson County, 2006.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-39

Name: Tripp Lake

County: Hutchinson

Legal Description: T97N-R61W-Sec. 20

Location from nearest town: 5 miles west, 1 ½ miles south of Tripp, SD.

Dates of present survey: June 6, 2006 (all species electrofishing)

Date last surveyed: June 8, 2004 (all species electrofishing)

Primary Game and Forage Species	Other Species
Largemouth Bass	Channel Catfish
Bluegill	Black Bullhead
	Green Sunfish
	Hybrid Sunfish

PHYSICAL DATA

Surface Area: 10 acres

Watershed: 1,920 acres

Maximum depth: 24 feet

Mean depth: 12 feet

Contour map available: Yes

Date mapped: 1970

Lake elevation observed during the survey: One foot low

Beneficial use classifications: (5) warmwater marginal fish propagation, (7) immersion recreation, (8) limited-contact recreation and (9) fish and wildlife propagation and stock watering.

Ownership of Lake and Adjacent Shoreline Property

Tripp Lake was constructed by the Works Progress Administration in the 1930's and the fishery is managed by the South Dakota Department of Game, Fish, and Parks (GFP). There is a 12 foot easement for public access around the entire lake.

Fishing Access

There is no boat ramp on Tripp Lake; however, small boats can be launched off a strip of sandy shoreline on the northeast corner of the lake. Shore fishing is available around the entire lake.

Field Observations of Water Quality and Aquatic Vegetation

The water in Tripp Lake was stained brown with a Secchi depth measurement of 1 m (39 in). Submerged vegetation was very abundant throughout the lake and common cattail (*Typha spp.*) surrounded 75% of the shoreline.

BIOLOGICAL DATA

Methods:

The entire shoreline of Tripp Lake was sampled on June 6, 2006 by 54 minutes of nighttime electrofishing.

Results and Discussion:

Electrofishing Catch

Bluegill (78.1%), hybrid sunfish (9.8%), and largemouth bass (9.4%) comprised over 95% of the electrofishing sample (Table 1). Thirteen black bullhead and one channel catfish were also sampled (Table 1).

Table 1. Total catch from 54 minutes of nighttime electrofishing at Tripp Lake, Hutchinson County, June 6, 2006.

Species	No.	%	CPH ¹	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Bluegill	406	78.1	406.0	+86.7	410.0	39	0	100
Hybrid Sunfish	51	9.8	51.0	+2.2	61.7	--	--	--
Largemouth Bass	49	9.4	49.0	+10.5	36.3	38	15	106
Black Bullhead	13	2.5	13.0	+1.3	9.7	85	38	112
Channel Catfish	1	0.2	1.0	+1.3	0.7	--	--	--

* 2 years (2000, 2002)

Largemouth Bass

Management objective: Maintain a largemouth bass fishery with an electrofishing CPUE of at least 20.

The size structure of the largemouth bass population in Tripp Lake was excellent and electrofishing CPH exceeded our management objective (Table 2). Bass growth is better than statewide, small impoundment and Region III averages and the fish were in excellent condition. Because adult largemouth bass from stunted populations were stocked (Table 7), the lengths-at-age in Table 3 reflect growth from the source water. Bass that averaged 25 cm (10-in) when stocked in 2002 averaged 38.7 cm (15.2 in) just two years later.

Extremely abundant submerged vegetation may be hindering natural reproduction since only one bass less than 20 cm (8 in) was sampled. Periodic adult bass stocking is needed to maintain the population. In addition, the expensive stocked fish are protected with a 15-inch minimum size limit. Without protection, about 86% of the population would be available to harvest (Figure 1).

¹ See Appendix A for definitions of CPUE, PSD, and mean Wr.

Table 2. Largemouth bass electrofishing catch per hour (CPH), PSD, RSD-P and mean Wr for Tripp Lake, Hutchinson County, 1996-2002.

	1996	1998	2000	2002	2004	2006	Mean*
CPH	51.0	44.7	19.0	45.0	45.0	49.0	40.9
PSD	18	93	100	43	100	38	71
RSD-P	8	24	100	43	96	15	54
Mean Wr	116	107	105	110	101	106	108

*5 years (1996, 1998, 2000, 2002, 2004)

Table 3. Average back-calculated lengths, in mm, for each age class of largemouth bass from Tripp Lake, Hutchinson County, June 6, 2006.

		Back-calculation Age								
Year Class	Age	N	1	2	3	4	5	6	7	8
2004	2	3	78	231						
2003	3	25	61	140	221					
2002	4	4	69	155	236	271				
2001	5	1	82	145	199	266	341			
2000	6	6	74	150	191	245	296	344		
1999	7	4	74	157	202	242	284	313	342	
1998	8	1	79	188	283	363	404	443	463	472
1997	9	1	155	220	310	378	414	445	462	479
1996	10	2	105	183	253	336	384	414	436	453
1995	11	1	108	160	239	270	296	322	348	374
1994	12	1	87	159	207	234	277	328	379	397
All Classes		49	88	172	234	289	337	373	405	435
Statewide Mean			96	182	250	305	342			
Region III Mean			111	212	287	347	383			
SLI* Mean			99	183	246	299	332			

*Small Lakes and Impoundments (<150 acres)

Bluegill

Management objective: Maintain a bluegill fishery with an electrofishing CPUE of at least 50 and RSD-18 of at least 20.

Bluegill CPUE decreased since 2004 but is still eight times greater than our management objective (Table 4). The size structure of the population has improved (Table 4) and there has been consistent reproduction and recruitment every year (Table 5). An exceptionally large year class was produced in 2004. The bluegills sampled ranged in length from 80-180 mm (3.1-7.1 in) (Figure 2) and growth is slower than statewide, regional and small lakes and impoundments means (Table 5) which is typical for high density populations.

Table 4. Bluegill electrofishing CPUE, PSD, RSD-P and mean Wr for Tripp Lake, Hutchinson County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CPUE		121.3		33		53		1,144		406
PSD		35		100		0		3		39
RSD-18		26		100		0		0		6
RSD-P		12		76		0		0		0
Mean Wr		116		107		120		122		100

Table 5. Average back-calculated lengths (mm) for each age class of bluegills in Tripp Lake, Hutchinson County, 2006.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2004	2	189	44	98						
2003	3	33	42	69	135					
2002	4	84	42	67	97	152				
2001	5	78	40	66	92	121	155			
All Classes		384	42	75	108	136	155			
Statewide Mean			55	103	141	166				
Region III Mean			60	116	157	180				
SLI* Mean			53	101	138	163				

*Small Lakes and Impoundments (<150 acres)

All Species

Bluegill, black bullhead, and hybrid sunfish CPUE decreased in 2006 while largemouth bass CPUE increased slightly (Table 6).

Table 6. Electrofishing CPH for all fish species sampled in Tripp Lake, Hutchinson County, 1997-2006.

Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CCF		--		1.0		1.0		--		1.0
LMB		44.7		19.0		45.0		45.0		49.0
BLG		121.3		33.0		53.0		1,144.0		406.0
GSF		24.7		193.0		122.0		3.0		--
HYB		--		--		53.0		132.0		51.0
BLB		0.7		1.0		4.0		24.0		13.0

CCF (Channel Catfish), LMB (Largemouth Bass), BLG (Bluegill), GSF (Green Sunfish), HYB (Hybrid Sunfish), BLB (Black Bullhead),

MANAGEMENT RECOMMENDATIONS

1. Stock adult largemouth bass as needed to achieve the management objective.
2. Continue biennial electrofishing surveys to monitor the fish population.
3. Investigate methods to reduce the abundance of aquatic vegetation.

Table 7. Stocking record for Tripp Lake, Hutchinson County, 1990-2006.

Year	Number	Species	Size
1992	2,800	Channel Catfish	Fingerling
	750	Largemouth Bass	Sml. Fingerling
2002	100	Largemouth Bass	Adult
2004	80	Channel Catfish	Adult
	100	Largemouth Bass	Adult

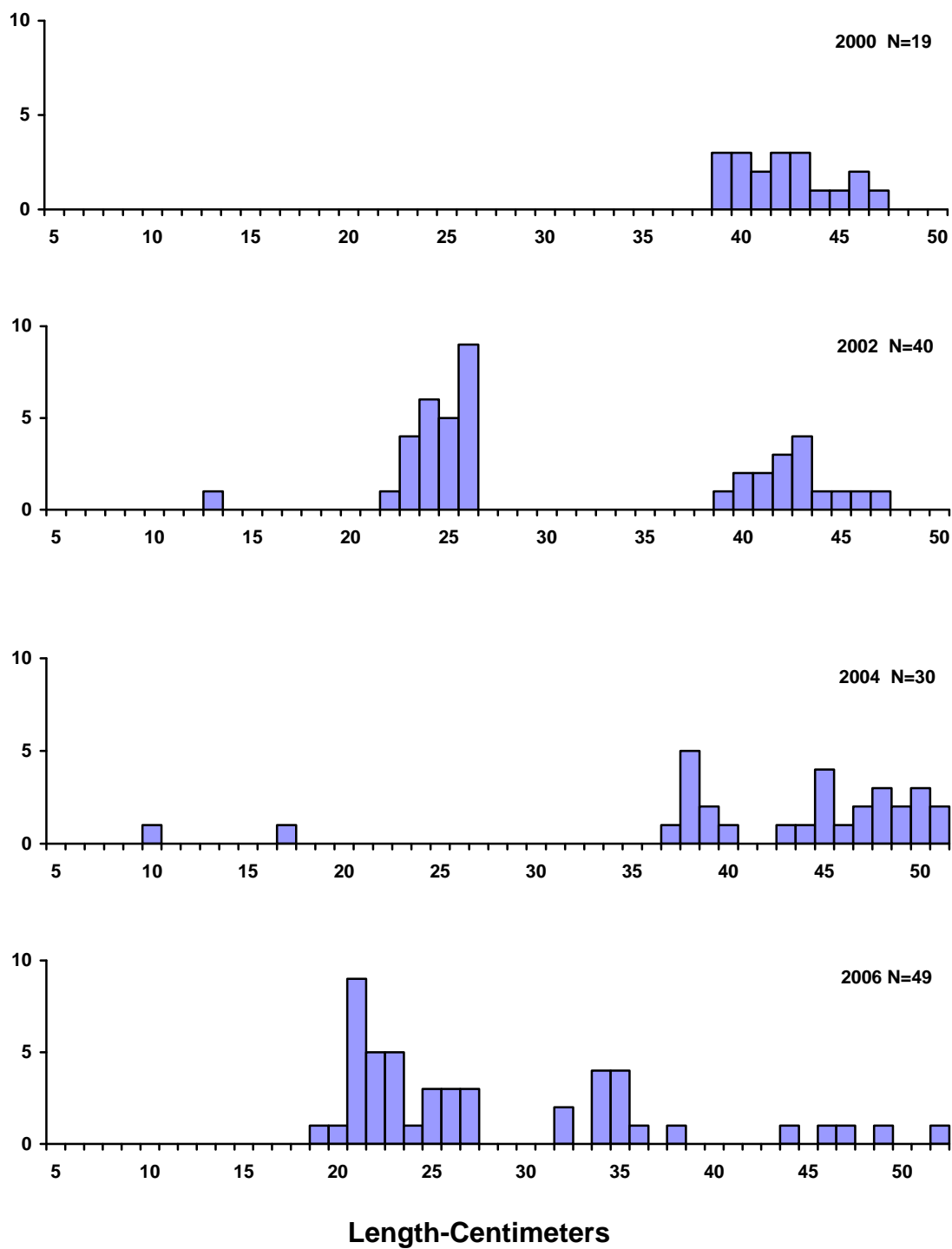


Figure 1. Length frequency histograms for largemouth bass sampled by electrofishing in Tripp Lake, Hutchinson County, 2000, 2002, 2004 and 2006.

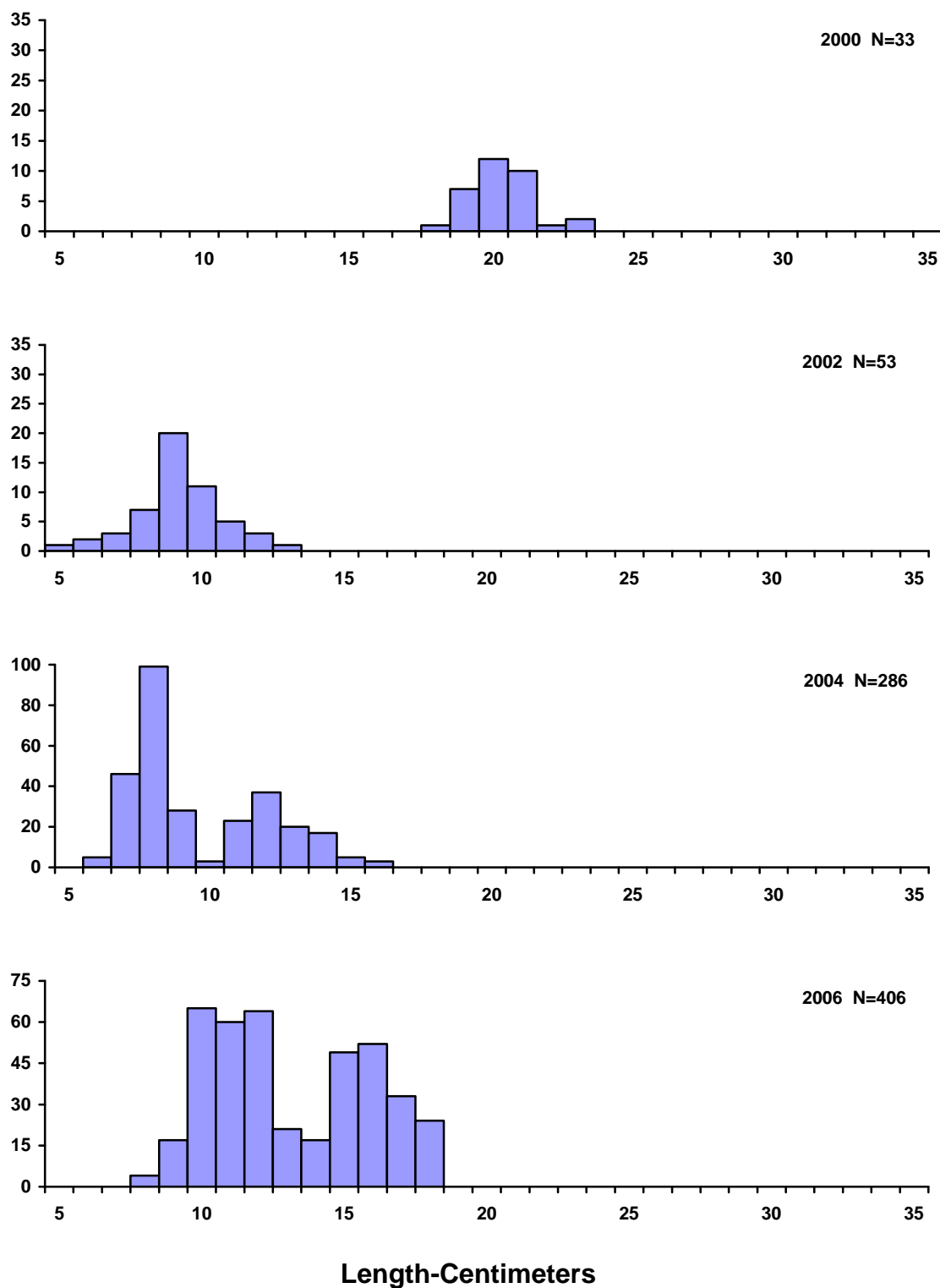


Figure 2. Length frequency histograms for bluegill sampled by electrofishing (2000, 2002, 2004 and 2006) in Tripp Lake, Hutchinson County.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-39

Name: Lake Thompson

Counties: Kingsbury and Miner

Legal Description: T110N-R55W-Sec.20-22, 28-33; T109N-R55W-Sec.4-9, 16-17;
T110N-R56W-Sec.36; T109N-R56W-Sec.1.

Location from nearest town: 6 miles south and 4 miles east of DeSmet, SD.

Dates of present survey: August 7-9, 2006 (netting); Sept. 25, 2006 (electrofishing)

Dates of last survey: August 8-10, 2005 (netting); Sept. 7, 2005 (electrofishing)

Primary Game Species	Other Species
Walleye	Northern Pike
Yellow Perch	Black Crappie
	Smallmouth Bass
	White Crappie
	Black Bullhead
	White Sucker
	Common Carp

PHYSICAL DATA

Surface area: 12,455 acre

Maximum depth: 26 feet

Volume: 148,692 acre-feet

Contour map available: Yes

OHWM elevation: None set

Outlet elevation: None set

Lake elevation observed during the survey: 7 feet low

Beneficial use classifications: (4) Warmwater permanent fish propagation, (7) immersion recreation, (8) limited-contact recreation and (9) fish and wildlife propagation and stock watering.

Watershed area: 263,044 acres

Mean depth: 14.5 feet

Shoreline length: 44.6 miles

Date mapped: 2002

Date set: NA

Date set: NA

Introduction

Lake Thompson is a very large, natural lake located in central Kingsbury County. The lake was named for John Thompson, a pioneer farmer and Civil War veteran. Lake Thompson had been nothing but a shallow marsh until heavy precipitation in the early 1980s caused the lake to grow to over 16,000 acres and almost 30 feet deep. It is now one of the more important fisheries in eastern South Dakota.

Ownership of Lake and Adjacent Lakeshore Properties

The State of South Dakota Listing of Meandered Lakes lists 8,000 acres of the original lakebed as meandered. The balance of the lake ownership is divided between private landowners, the South Dakota Department of Game, Fish, and Parks (GFP), and the United States Fish and Wildlife Service. The GFP Wildlife Division manages the fishery and Game Production Areas while the Parks Division manages the Recreation and Lake Access Areas.

Fishing Access

The Northeast Access Area, located on the northeast corner of the lake, has a double lane boat ramp, dock, parking lot, public toilet and shore fishing access. The Lake Thompson Recreation Area, also located on the northeast shore of the lake, has a double lane boat ramp, dock, public toilet, parking lot, campgrounds, swim beach, and shore fishing access. The North Access Area, located on the northwestern shore of the lake, has a boat ramp, dock, public toilet and shore fishing access. The West Access Area, located on the west shore of the lake, has a double lane boat ramp, dock, public toilet, parking lot, and shore fishing access.

Field Observations of Water Quality and Aquatic Vegetation

During the lake survey, the Secchi depth measurement was 1.0 m (39.4 inches). No vegetation was observed during the survey. Water temperatures were around 23.3°C (74 °F).

BIOLOGICAL DATA

Methods:

Lake Thompson was sampled on August 7-9, 2006 with four overnight gill-net sets and 11 overnight trap-net sets. The trap nets are constructed with 19-mm-bar-mesh ($\frac{3}{4}$ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh ($\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, and 2 in) monofilament netting. Two hours of nighttime electrofishing was done on September 25, 2006 to evaluate walleye recruitment. Sampling sites are displayed in Figure 7.

Results and Discussion:

Gill Net Catch

Walleye (59.4%) and common carp (24.0%) were the most abundant species in the gill-net catch this year (Table 1). Yellow perch, northern pike, black crappie, spottail shiner, white sucker, smallmouth bass, and white bass were also sampled.

Table 1. Total catch from four overnight gill net sets at Lake Thompson, Kingsbury County, August 7-9, 2006.

Species	No.	%	CPUE ¹	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Walleye	104	59.4	26.0	±6.1	37.0	22	1	88
Common Carp	42	24.0	10.5	±3.4	2.8	21	14	103
Yellow Perch	13	7.4	3.3	±0.3	45.0	100	54	112
Northern Pike	6	3.4	1.5	±0.8	1.6	--	--	--
Black Crappie	4	2.3	1.0	±1.3	3.6	--	--	--
Spottail Shiner	3	1.7	0.8	±1.0	1.1	--	--	--
White Sucker	1	0.6	0.3	±0.3	1.0	--	--	--
Smallmouth Bass	1	0.6	0.3	±0.3	0.4	--	--	--
White Bass	1	0.6	0.3	±0.3	0.0	--	--	--

* 10 years (1996-2005)

Trap Net Catch

Common carp (52.1%) and walleye (15.1%) were the most common species in the trap net catch (Table 2). Other species included northern pike, black crappie, black bullhead, and smallmouth bass.

Table 2. Total catch from eleven overnight trap net sets at Lake Thompson, Kingsbury County, August 7-9, 2006.

Species	No.	%	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Common Carp	38	52.1	4.2	±1.6	13.7	42	38	102
Walleye	11	15.1	1.2	±0.6	9.8	45	18	89
Northern Pike	7	9.6	0.8	±0.5	5.4	--	--	--
Black Crappie	7	9.6	0.8	±0.7	4.6	--	--	--
Black Bullhead	6	8.2	0.7	±0.3	220.5	--	--	--
Smallmouth Bass	4	5.5	0.4	±0.4	0.8	--	--	--

* 10 years (1996-2005)

Walleye

Management objective: Maintain a walleye population with a gill-net CPUE of at least 20, a PSD range of 30-60, an RSD-P of 10 or more, and a growth rate of 14 inches by age-3.

Walleye gill-net CPUE remained above the management objective of 20 (Table 3). The majority (83%) of the catch was age-2 fish from the large 2004 year class and these fish had a mean length of 343 mm (13.5 inches). This large year class was responsible for the reduced PSD and RSD-P values seen this year.

See Appendix A for definitions of CPUE, PSD, and mean Wr.

Walleye growth has slowed considerably in the last two years and is similar to that observed in the late-1990s (Table 4). Lake Thompson walleyes reached 35.6 cm or 14 inches by age 3 only two of the last six years. Those years with faster growth coincided with high abundance of small yellow perch. Slower growth may be attributed to decreased lake productivity caused by declining water levels and lower prey abundance, especially yellow perch. Walleye condition (mean Wr) remained near average in 2006 (Table 3).

Table 3. Walleye gill-net CPUE, PSD, RSD-P and mean Wr for Lake Thompson, Kingsbury County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	41.7	48.5	56.7	43.3	49.0	31.7	22.8	16.0	34.0	26.0	37.0
PSD	11	22	36	55	32	49	27	24	38	22	30
RSD-P	1	1	3	8	8	4	8	4	3	1	4
Mean Wr	95	90	95	90	90	94	83	89	91	88	90

*10 years (1996-2005)

Table 4. Average back-calculated lengths (mm) for each age class of walleye in Lake Thompson, Kingsbury County, 2006.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2005	1	4	211							
2004	2	83	129	285						
2003	3	4	155	251	351					
2001	5	3	165	261	322	387	442			
2000	6	6	149	246	311	368	407	449		
All Classes		100	162	261	328	378	425	449		
Statewide Mean			168	279	360	425	490			
Region III Mean			173	281	367	435	517			
LLI* Mean			169	280	358	425	494			

*Large Lakes and Impoundments (>150 acres)

Lake Thompson was stocked with 6,250,000 walleye fry in 2006. A portion of these fry were marked with oxytetracycline (OTC) to allow evaluation of stocking contribution. Fall electrofishing indicated that a moderate year class was produced. However, examination of 50 age-0 fish for OTC marks indicated that only 4% of the walleye production could be attributed to fry stocking. Age-0 walleyes were large; however, condition was at the low end of the 8-year range. A few yearling walleyes from the weak 2005 year class were also sampled.

Table 5. Age-0 and age-1 walleyes sampled during 2 hours of nighttime electrofishing on Lake Thompson, Kingsbury County, 1999-2006

Year	Stocking	Age-0 CPH	80% C.I.	% stocked	Mean length (range; mm)	Wr	Age-1 CPH	80% C.I.	Mean length (range; mm)	Wr
2006	fry ¹	43	29-57	4	203 (167-236)	91	2	0-2	324 (317-328)	85
2005	none	5	2-8		197 (181-200)	104	50	34-67	289 (250-323)	88
2004	fry	290	132-447	74	131 (110-170)	93	2	1-3	283 (270-290)	85
2003	none	16	6-26		169 (158-181)	94	4	2-6	255 (232-271)	83
2002	none	78	42-114		154 (127-186)	104	13	4-21	260 (218-188)	87
2001	none	202	136-268		169 (129-216)	105	10	6-13	257 (245-269)	89
2000	none	231	117-345		153 (120-192)	93	52	38-66	238 (203-290)	83
1999	none	155	99-211							

¹ Stocked with 17,935 large fingerlings (5.0/lb) after electrofishing was completed.

Yellow Perch

Management objective: Maintain a yellow perch population with a gill-net CPUE of at least 30 and a PSD range of 30-60.

Yellow perch gill-net CPUE continues to decline (Table 6). Large perch (23-30 cm, 9-12 in) from the 2001 year-class comprise the majority of the population and recruitment has been poor or lacking since 2001 (Table 7). The sampled fish were in excellent condition and their growth remains well above statewide, regional and large lakes means (Table 7).

Table 6. Yellow perch gill-net CPUE, PSD, RSD-P and mean Wr in Lake Thompson, Kingsbury County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	44.0	120.0	64.0	34.7	45.2	54.7	6.5	16.3	7.3	3.3	45.0
PSD	73	52	38	64	65	20	87	89	76	100	62
RSD-P	17	43	24	17	25	7	3	36	59	54	27
Mean Wr	121	110	106	116	117	117	110	112	107	112	113

*10 years (1996-2005)

Table 7. Average back-calculated lengths (mm) for each age class of yellow perch in Lake Thompson, Kingsbury County, 2006.

Back-calculation Age										
Year Class	Age	N	1	2	3	4	5	6	7	8
2004	2	5	83	189						
2001	5	8	91	170	221	247	261			
All Classes		13	87	180	221	247	261			
Statewide Mean			86	145	190	220	242			
Region III Mean			94	159	208	242	281			
LLI* Mean			86	146	192	225	249			

*Large Lakes and Impoundments (>150 acres)

Black Crappie

Black crappie trap net CPUE was the lowest seen since 1999 (Table 8) and very little recruitment has occurred for several years. However, our creel surveys show the fishery is better than the survey data suggests (Tables 12-15). Our trap nets do not effectively sample black crappies on the shallow flats near shore caused by declining water levels.

Table 8. Black crappie trap-net CPUE, PSD, RSD-P and mean Wr in Lake Thompson, Kingsbury County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	4.6	4.6	0.5	11.6	5.4	13.0	1.3	1.4	2.5	0.8	4.6
PSD	100	45	--	94	96	18	100	97	100	--	81
RSD-P	88	43	--	24	74	16	22	19	100	--	48
Mean Wr	116	143	--	128	122	125	114	92	107	--	118

*10 years (1996-2005)

Northern Pike

As with other species, northern pike reproduction has been poor due to declining water levels. Trap-net CPUE is the lowest seen since surveys were started in 1989 (Table 9). The mean length of sampled fish was 772 mm (30.4 in) (Figure 4).

Table 9. Northern pike trap-net CPUE, PSD, RSD-P and mean Wr in Lake Thompson, Kingsbury County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	5.3	3.3	5.7	7.6	3.9	4.0	5.1	0.9	4.7	0.8	5.4
PSD	64	67	74	84	97	82	28	--	96	--	74
RSD-P	11	11	9	24	5	28	19	--	38	--	19
Mean Wr	90	93	88	87	89	84	72	--	80	--	86

*10 years (1996-2005)

Black Bullhead

Black bullhead trap net CPUE was the lowest seen since 1995 (Table 10). The fish sampled ranged in length from 16-32 cm (6.3-12.6 inches) (Figure 5).

Table 10. Black bullhead trap-net CPUE, PSD, RSD-P and mean Wr for Lake Thompson, Kingsbury County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	1.9	571.4	989.0	59.7	145.1	292.4	122.1	4.0	2.3	0.7	220.5
PSD	--	53	68	28	77	19	71	97	92	--	59
RSD-P	--	3	0	2	62	16	3	19	52	--	18
Mean Wr	--	100	97	103	93	95	97	92	90	--	96

*10 years (1996-2005)

All Species

Overall, CPUE for most species remained low in 2006 (Table 11). We believe this is mostly due to poor reproduction and recruitment caused by several years of decreasing water levels. A white bass was sampled in Lake Thompson for the first time this year.

Table 11. Gill-net (GN) and trap-net (TN) CPUE for all fish species sampled in Lake Thompson, Kingsbury County, 1997-2006.

Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
NOP (GN)	1.0	3.8	1.7	1.7	0.7	1.7	0.8	0.8	0.3	1.5
NOP (TN)	5.3	3.3	5.7	7.6	3.9	4.0	5.1	0.9	4.7	0.8
SMB (GN)				0.3	0.7	1.7	0.3	0.2	0.8	0.3
SMB (TN)	0.1	1.2	0.1	1.7	0.3	1.8	2.0	0.3	0.2	0.4
WAE (GN)	41.7	48.5	56.7	43.3	49.0	31.7	22.8	16.0	34.0	26.0
WAE (TN)	7.1	18.6	6.2	4.5	5.2	7.3	6.9	1.6	26.5	1.2
BLC (GN)	2.3	13.0	5.0	0.3	9.5	4.3	0.3	0.8	0.5	1.0
BLC (TN)	4.6	4.6	0.5	11.6	5.4	13.0	1.3	1.4	2.5	0.8
BLG (GN)										
BLG (TN)					0.1					
YEP (GN)	44.0	120.0	64.0	34.7	45.2	54.7	6.5	16.3	7.3	3.3
YEP (TN)	0.2	2.4	0.2	0.3	0.4	0.4	0.3			
WHB (GN)										0.3
WHB (TN)										
BLB (GN)	1.0	5.8	75.3	50.7	5.5	141.7	154.5	10.8		
BLB (TN)	1.9	571.4	989.0	59.7	145.1	292.4	122.1	4.0	2.3	0.7
COC (GN)	1.0	2.5	7.3	4.0	2.2	5.0	0.7	0.7	4.0	10.5
COC (TN)	15.6	29.1	22.9	11.9	4.1	4.2	5.1	5.8	3.7	4.2
SPS (GN)		0.8	2.7	1.3	2.2	1.0		3.0		0.8
SPS (TN)										
WHS (GN)	0.7	1.8		3.7	0.7	0.3	0.2		0.8	0.3
WHS (TN)	0.3		0.2	1.8	0.9	0.3		0.3	0.5	

NOP (Northern Pike), SMB (Smallmouth Bass), WAE (Walleye), BLC (Black Crappie), BLG (Bluegill), YEP (Yellow Perch), WHB (White Bass), BLB (Black Bullhead), COC (Common Carp), SPS (Spottail Shiner), WHS (White Sucker)

Creel Survey Results (Summer)

Fishing pressure on Lake Thompson has been steadily declining as water levels recede and, for summer 2006, was the lowest on record totaling just over 70,000 hours (Table 12). Although the highest fishing pressure was recorded in June (Figure 6), a greater percentage of the summer fishing pressure occurred in May than in previous years. About 89% of parties fishing Lake Thompson were South Dakota residents and 88% were primarily targeting walleyes. Secondary targets included black crappie (50%) and yellow perch (21%).

Walleye catch and harvest increased in 2006 (Table 12). Catch and harvest rates were substantially higher than in 2004 or 2005 (Table 13) and peaked in July at 0.39/h and 0.24/h, respectively. The mean length of walleyes harvested was about 38 cm (15 in) and 62% of the walleyes harvested were over 35.6 cm (14 in) long (Figure 7).

Black crappie catch and harvest decreased in 2006 and was similar to 2002-2004 (Table 12). Overall, catch and harvest rates were low (Table 14), however, parties targeting crappies caught well over one fish per hour in May (1.3/h) and June (1.5/h). Most crappies harvested were over 25 cm (10 in) long.

Catch and harvest of yellow perch and northern pike were at a 10-year low (Table 13). Natural reproduction of these two species undoubtedly has been impacted by decreasing water levels. The smallmouth bass fishery was similar to 2005 (Table 12).

Creel Survey Results (Winter)

Winter 2005-06 fishing pressure declined from the three preceding winters and was similar to the winters of 1998-2002 (Table 14). Fishing pressure was evenly distributed across the 4-month period (Figure 6). South Dakota residents accounted for 93% of the total pressure.

About 67% of parties interviewed were targeting walleyes. Nearly 12% were fishing for anything that bit and 17% were targeting perch. Angling parties were asked their opinion on several regulation scenarios. Only 19% of parties interviewed were in favor of reducing the statewide daily walleye limit from four to three with 65% opposed and 16% neutral towards the change. When asked their opinion on reducing the statewide panfish limit from 25 to 10, 42% favored the change, 20% were neutral and 38% were opposed. Only 21% of parties asked were in favor of reducing the pike limit from six to three with 41% neutral.

The winter 2005-06 walleye catch and harvest rates were similar to 2004-05 (Table 15). Catch and harvest rates were at the low end of the 10-year period. About 62% of walleyes harvested were over 35.6 cm (14 in) long (Figure 8).

Black crappie catch and harvest were down significantly from winter 2004-05 (Table 14). Yellow perch catch and harvest were also down from the preceding year, but similar to the winters of 2000 to 2004 (Table 14). Fishing for northern pike was at a 10-year low (Table 14). An estimated 57 and 36 smallmouth bass were caught and harvested, respectively.

Table 12. Estimates of fishing pressure and catch (harvest) of fish on Lake Thompson from May through August, 1997-2006.

Year	Pressure (h)	Walleye Catch (Harvest)	Northern Pike Catch (Harvest)	Yellow Perch Catch (Harvest)	Black Crappie Catch (Harvest)	SM Bass Catch(Harvest)
2006	71,517	45,648 (18,397)	486 (66)	631 (405)	1,677 (1,526)	728 (123)
2005	79,613	22,643 (13,473)	1,707 (593)	2,382 (2,201)	4,085 (2,438)	800 (296)
2004	115,146	65,050 (26,419)	8,268 (1,522)	923 (724)	1,788 (1,330)	2,013 (758)
2003	135,476	85,461 (35,395)	11,367 (2,069)	5,293 (4,337)	2,216 (1,770)	2,695 (787)
2002	116,259	82,381 (32,420)	7,694 (1,652)	12,953 (7,501)	2,452 (1,942)	2,039 (750)
2001	125,710	59,663 (18,108)	7,115 (2,486)	3,547 (3,140)	631 (530)	1,612 (455)
2000	130,175	100,774 (35,274)	13,937 (2,191)	18,938 (14,644)	334 (334)	2,551 (369)
1999	182,813	142,329 (71,339)	29,029 (5,436)	11,679 (9,196)	328 (303)	671 (328)
1998	162,913	162,957 (57,951)	23,983 (3,523)	13,396 (11,243)	2,121 (2,052)	799 (142)
1997	178,061	198,644 (62,877)	52,247 (11,072)	11,983 (8,729)	1,144 (926)	63 (0)

Table 13. Number of interviews and estimates of catch and harvest rates (number/hour) on Lake Thompson from May through August, 1997-2006.

Year	Number of Interviews	Walleye Catch (Harvest)	Northern Pike Catch (Harvest)	Yellow Perch Catch (Harvest)	Black Crappie Catch (Harvest)	SM Bass Catch (Harvest)
2006	233	0.64 (0.26)	0.007 (0.001)	0.009 (0.006)	0.02 (0.02)	0.01 (0.002)
2005	310	0.29 (0.17)	0.02 (0.007)	0.03 (0.03)	0.05 (0.03)	0.01 (0.004)
2004	599	0.56 (0.23)	0.07 (0.01)	0.008 (0.006)	0.02 (0.01)	0.02 (0.01)
2003	431	0.63 (0.26)	0.08 (0.02)	0.04 (0.03)	0.02 (0.01)	0.02 (0.01)
2002	551	0.71 (0.28)	0.07 (0.01)	0.11 (0.06)	0.02 (0.02)	0.02 (0.01)
2001	566	0.47 (0.14)	0.06 (0.02)	0.03 (0.03)	0.01 (0.01)	0.01 (0.01)
2000	279	0.77 (0.27)	0.11 (0.02)	0.15 (0.11)	0.01 (0.01)	0.02 (0.01)
1999	435	0.78 (0.39)	0.12 (0.04)	0.06 (0.05)	0.01 (0.01)	0.01 (0.01)
1998	854	1.00 (0.36)	0.18 (0.03)	0.08 (0.07)	0.01 (0.01)	0.01 (0.01)
1997	531	1.16 (0.35)	0.29 (0.06)	0.07 (0.05)	0.01 (0.01)	0.01 (0)

Creel Survey Results (winter)

Table 14. Estimates of fishing pressure and catch (harvest) of fish on Lake Thompson from December through March, 1997-2006.

Year	Pressure (h)	Walleyes Catch (Harvest)	Northern Pike Catch (Harvest)	Yellow Perch Catch (Harvest)	Black Crappies Catch (Harvest)	SM Bass Catch (Harvest)
2005-06	18,587	1,912 (1,136)	163 (107)	861 (728)	193 (185)	57 (36)
2004-05	28,202	3,040 (2,238)	1,177 (842)	1,673 (1,566)	3,172 (3,152)	50 (50)
2003-04	27,400	7,825 (3,063)	1,314 (786)	366 (351)	1,339 (1,317)	34 (4)
2002-03	29,021	9,252 (3,954)	1,079 (715)	961 (732)	187 (187)	0 (0)
2001-02	12,011	1,886 (542)	95 (47)	957 (944)	18 (18)	11 (11)
2000-01	17,690	8,019 (2,659)	1,368 (1,082)	866 (795)	0 (0)	17 (0)
1999-00	15,065	5,462 (1,963)	1,182 (468)	1,390 (683)	0 (0)	56 (4)
1998-99	20,162	5,080 (1,910)	670 (257)	5,618 (4,606)	36 (36)	0 (0)
1997-98	44,477	20,079 (7,150)	2,796 (1,366)	7,458 (7,324)	1,077 (1,077)	0 (0)

Table 15. Number of parties interviewed and estimates of catch and harvest rate (number/hour) of fish on Lake Thompson from December through March, 1997-2006.

Year	Number of Interviews	Walleyes Catch (Harvest)	Northern Pike Catch (Harvest)	Yellow Perch Catch (Harvest)	Black Crappies Catch (Harvest)	SM Bass Catch (Harvest)
2005-06	420	0.10 (0.06)	0.009 (0.006)	0.05 (0.04)	0.01 (0.01)	0.003 (0.002)
2004-05	492	0.11 (0.08)	0.04 (0.03)	0.06 (0.05)	0.11 (0.11)	0.002 (0.002)
2003-04	327	0.29 (0.11)	0.05 (0.03)	0.01 (0.01)	0.05 (0.05)	0.001 (0.0001)
2002-03	391	0.32 (0.14)	0.04 (0.02)	0.03 (0.03)	0.006 (0.006)	0 (0)
2001-02	185	0.15 (0.05)	0.008 (0.004)	0.08 (0.08)	0.002 (0.002)	0.001 (0.001)
2000-01	377	0.45 (0.15)	0.08 (0.03)	0.09 (0.05)	0 (0)	0.004 (0.003)
1999-00	398	0.36 (0.13)	0.08 (0.02)	0.07 (0.03)	0 (0)	0.01 (0.01)
1998-99	345	0.25 (0.10)	0.03 (0.01)	0.28 (0.23)	0.01 (0.01)	0 (0)
1997-98	567	0.45 (0.16)	0.06 (0.03)	0.17 (0.16)	0.02 (0.02)	0 (0)

MANAGEMENT RECOMMENDATIONS

1. Continue to monitor the Lake Thompson fishery with annual netting surveys, creel surveys, and fall electrofishing surveys. Should natural reproduction fail to maintain fish populations, supplemental stockings may be considered.
2. Maintain usable access during low water periods.

Table 16. Stocking record for Lake Thompson, Kingsbury County, 1991-2006.

Year	Number	Species	Size
1991	283	Walleye	Adult
	52,038	Largemouth Bass	Sml. Fingerling
	10,850	Largemouth Bass	Med. Fingerling
	30,000	Smallmouth Bass	Fingerling
	160	Gizzard Shad	Adult
1995	60,000	Largemouth Bass	Fingerling
	100,000	Smallmouth Bass	Fingerling
1996	99,270	Largemouth Bass	Fingerling
	151,870	Smallmouth Bass	Fingerling
2004	10,000,000	Walleye	Fry
2006	6,250,000	Walleye	Fry
	17,935	Walleye	Lrg. Fingerling

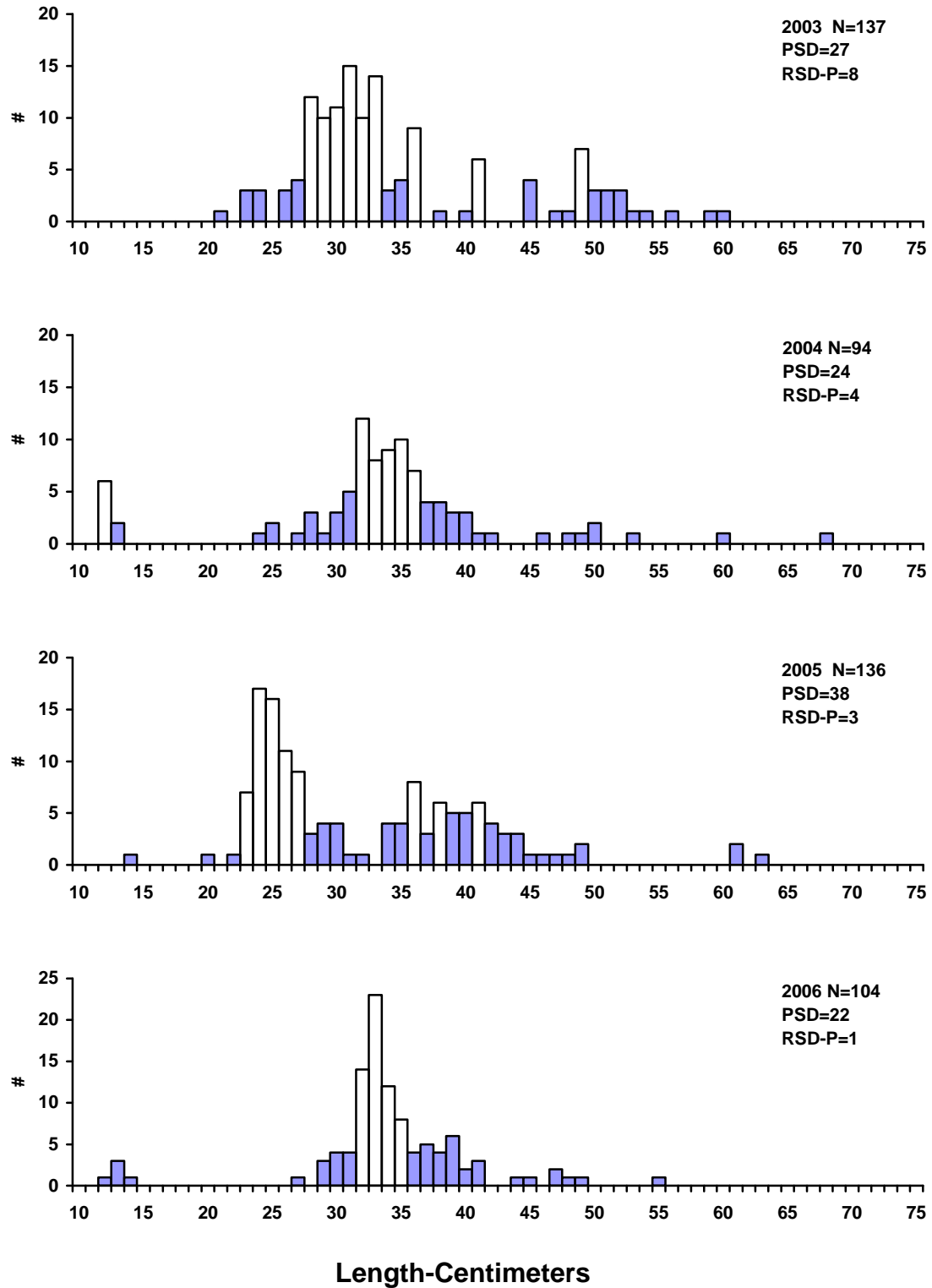


Figure 1. Length frequency histograms for walleye sampled with gill nets in Lake Thompson, Kingsbury County, 2003-2006.

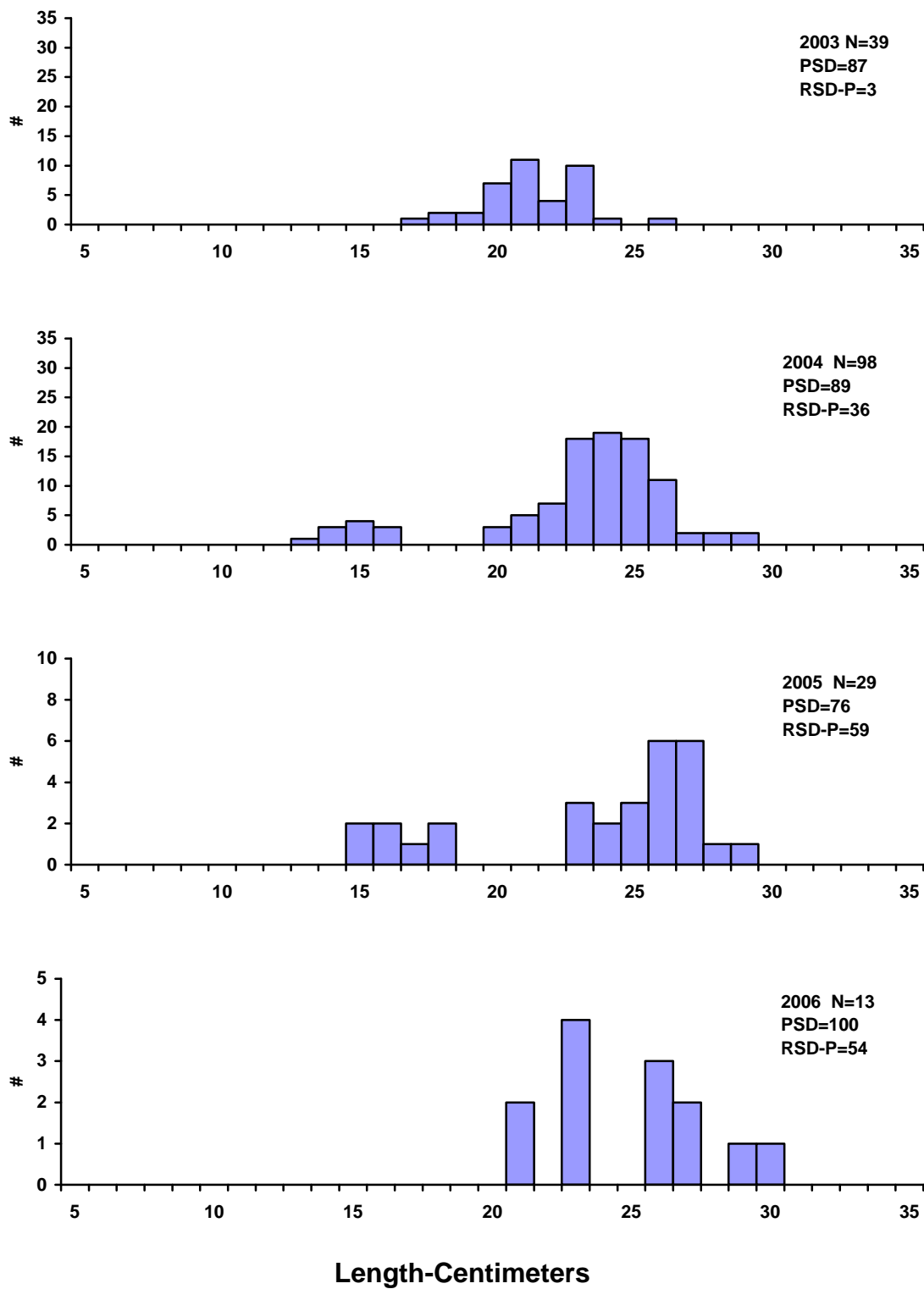


Figure 2. Length frequency histograms for yellow perch sampled with gill nets in Lake Thompson, Kingsbury County, 2003-2006.

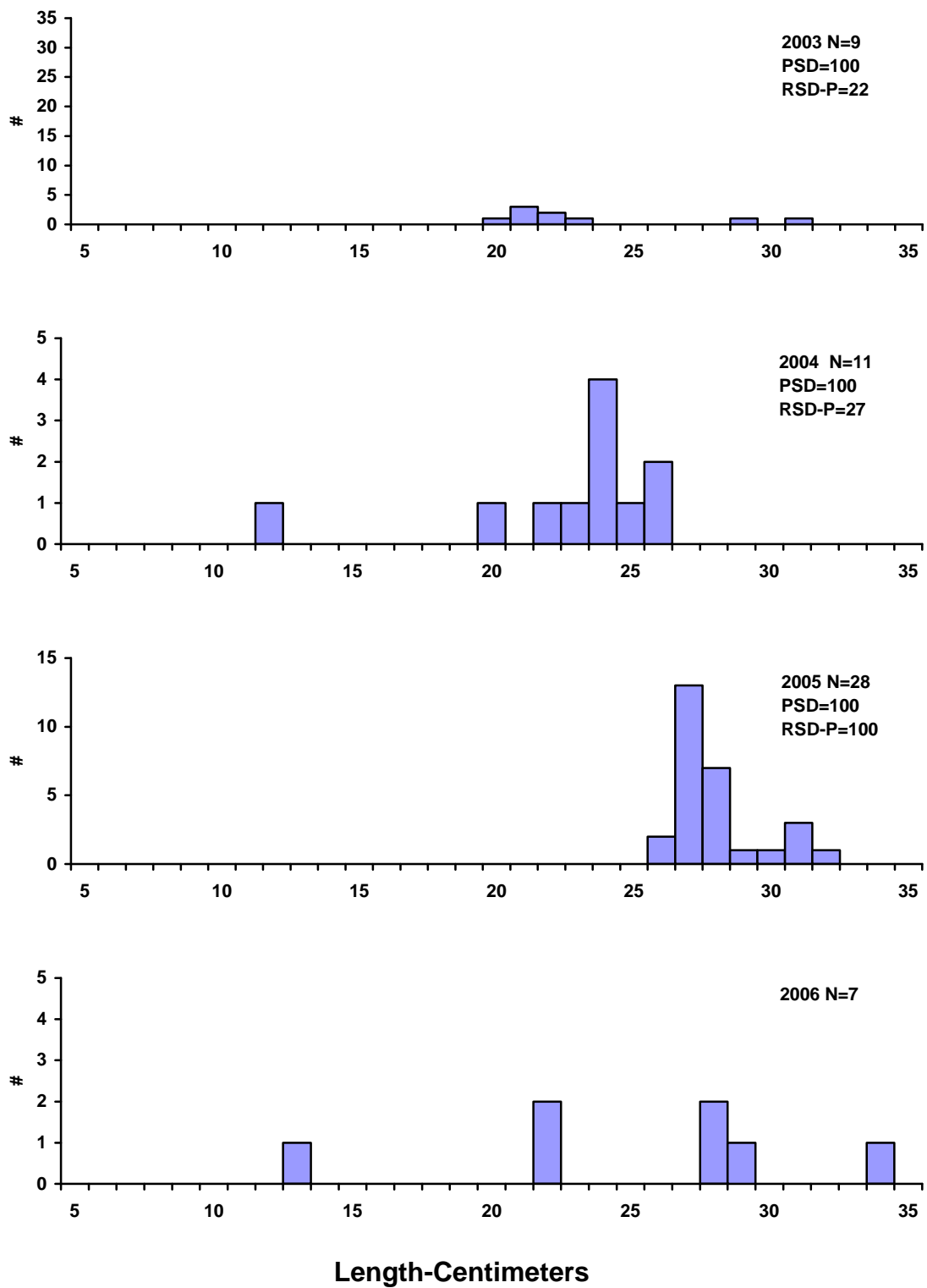


Figure 3. Length frequency histograms for black crappies sampled with trap nets in Lake Thompson, Kingsbury County, 2003-2006.

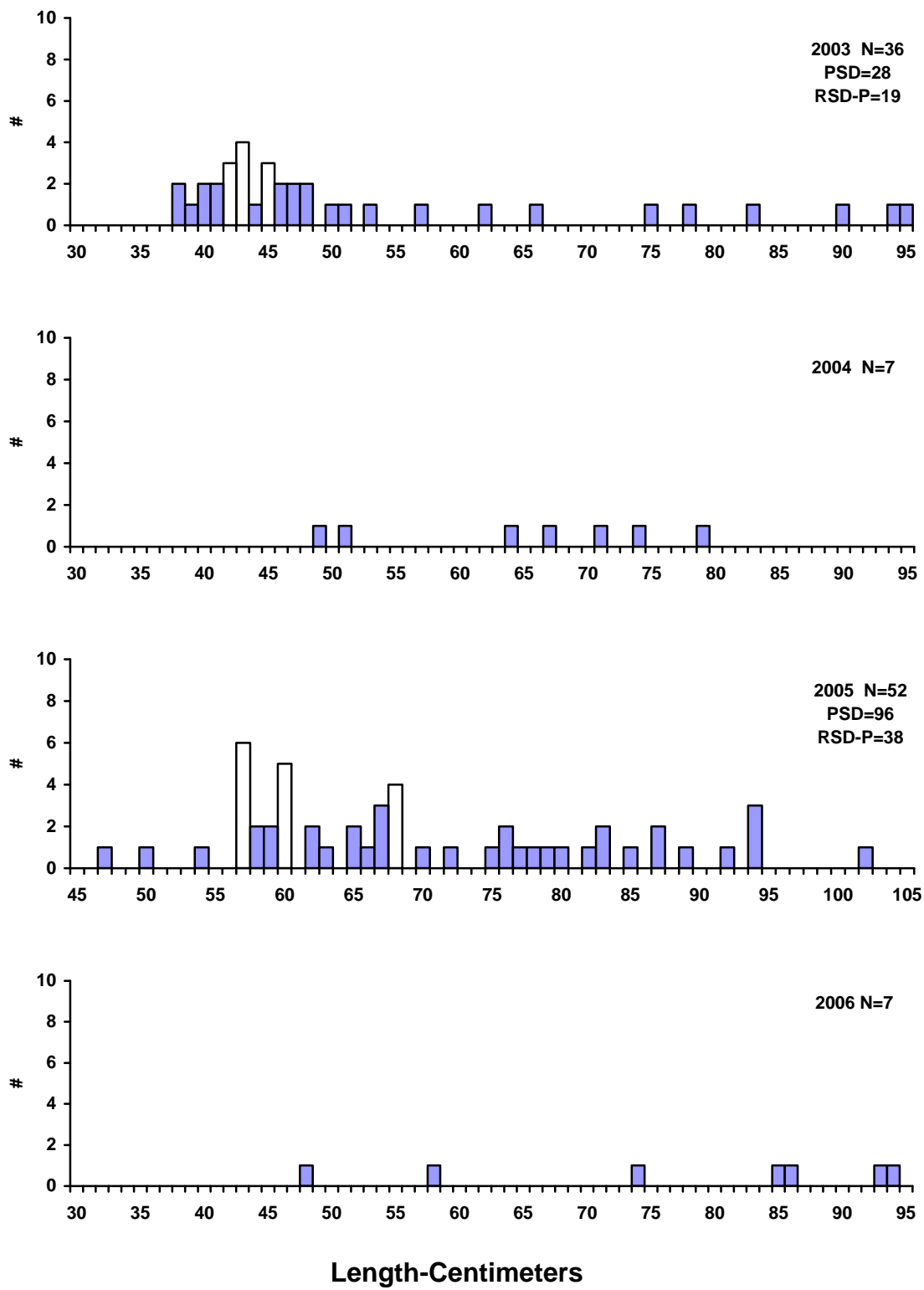


Figure 4. Length frequency histograms for northern pike sampled with trap nets in Lake Thompson, Kingsbury County, 2003-2006.

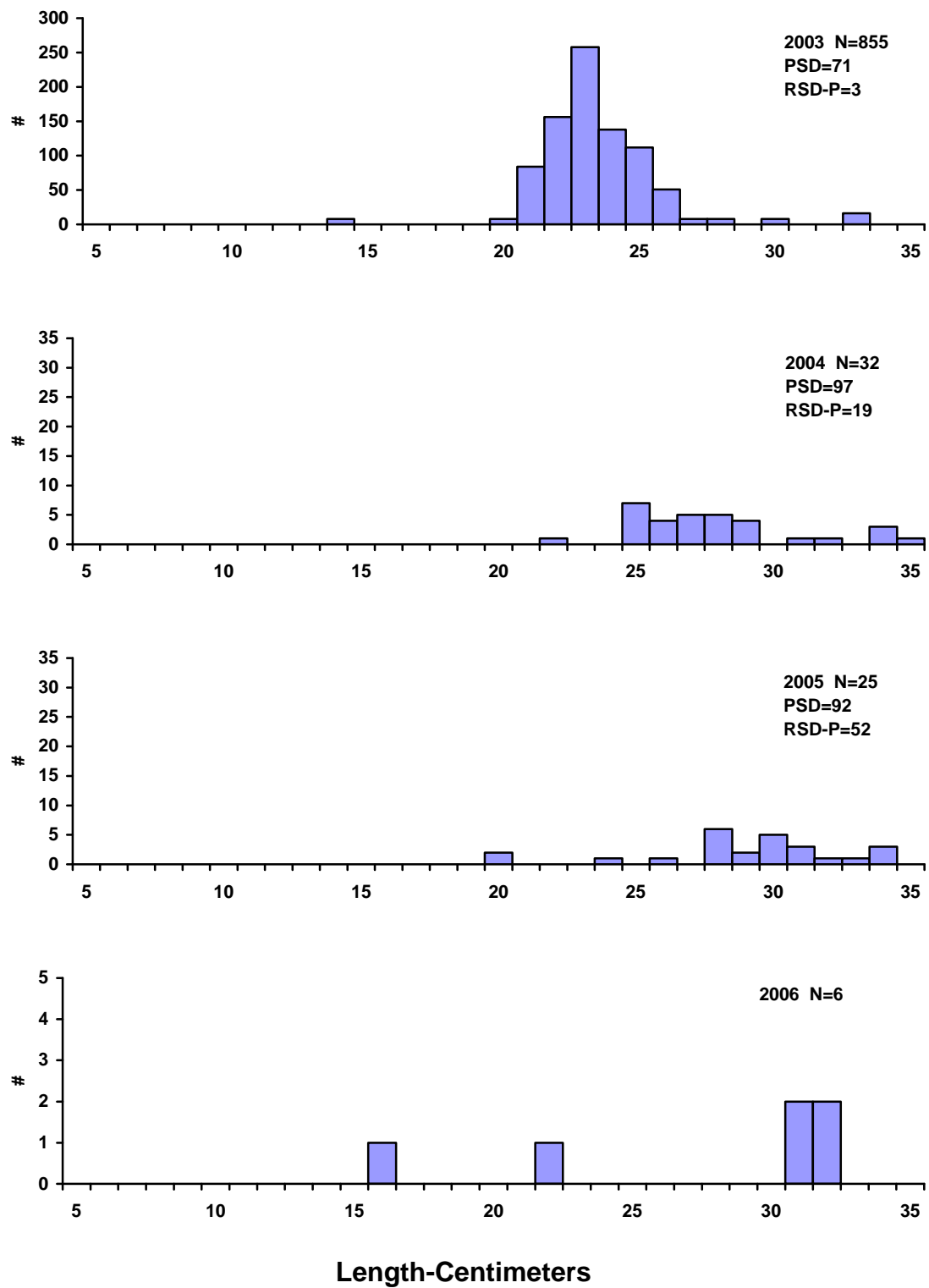


Figure 5. Length frequency histograms for black bullheads sampled with trap nets in Lake Thompson, Kingsbury County, 2003-2006.

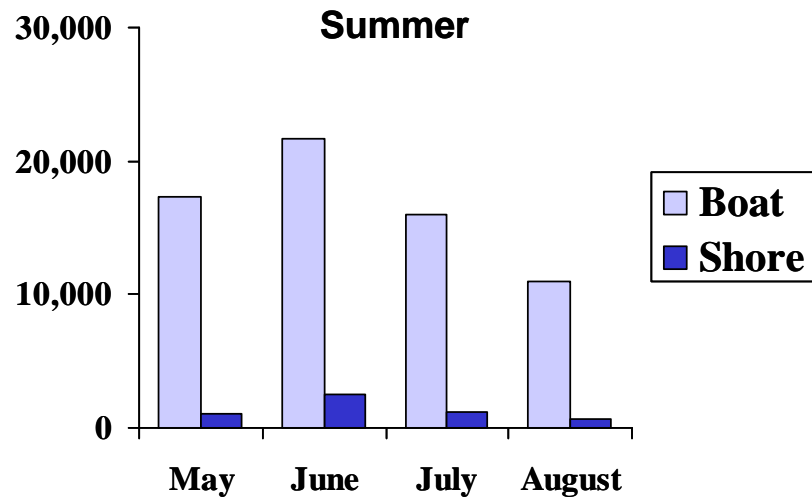
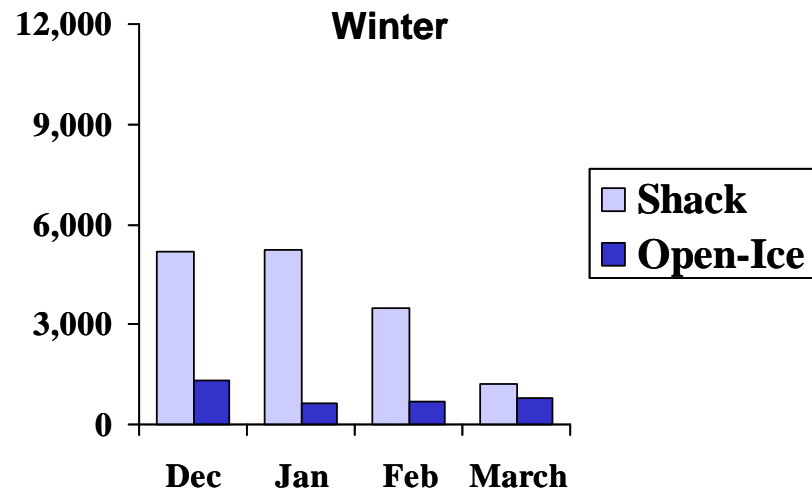


Figure 6. Monthly fishing pressure on Lake Thompson during winter 2005-06 (top) and summer 2006 (bottom).

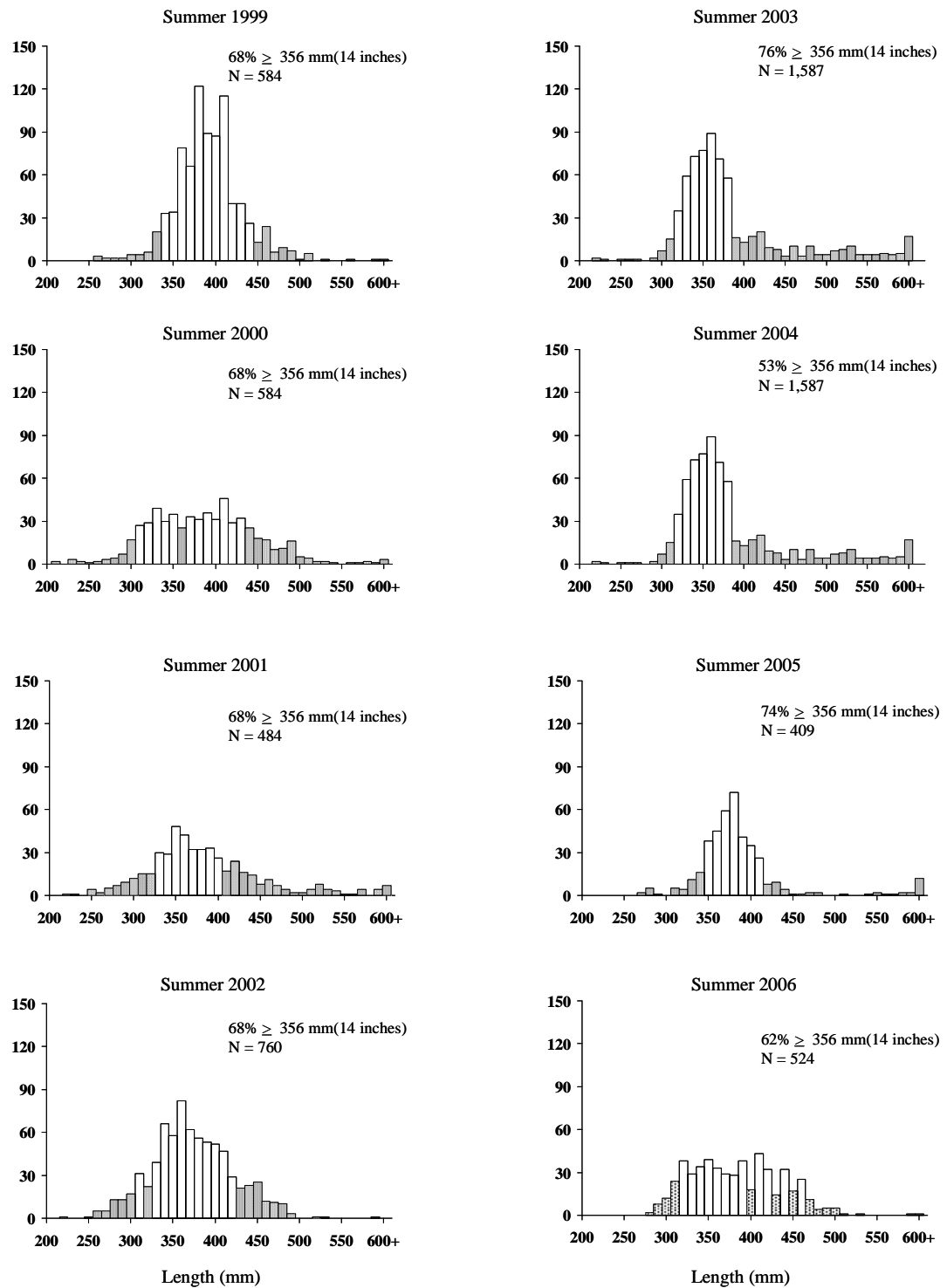


Figure 7. Length frequency of angler-harvested walleyes measured by the creel clerk during summer creel surveys on Lake Thompson, 1999-2006.

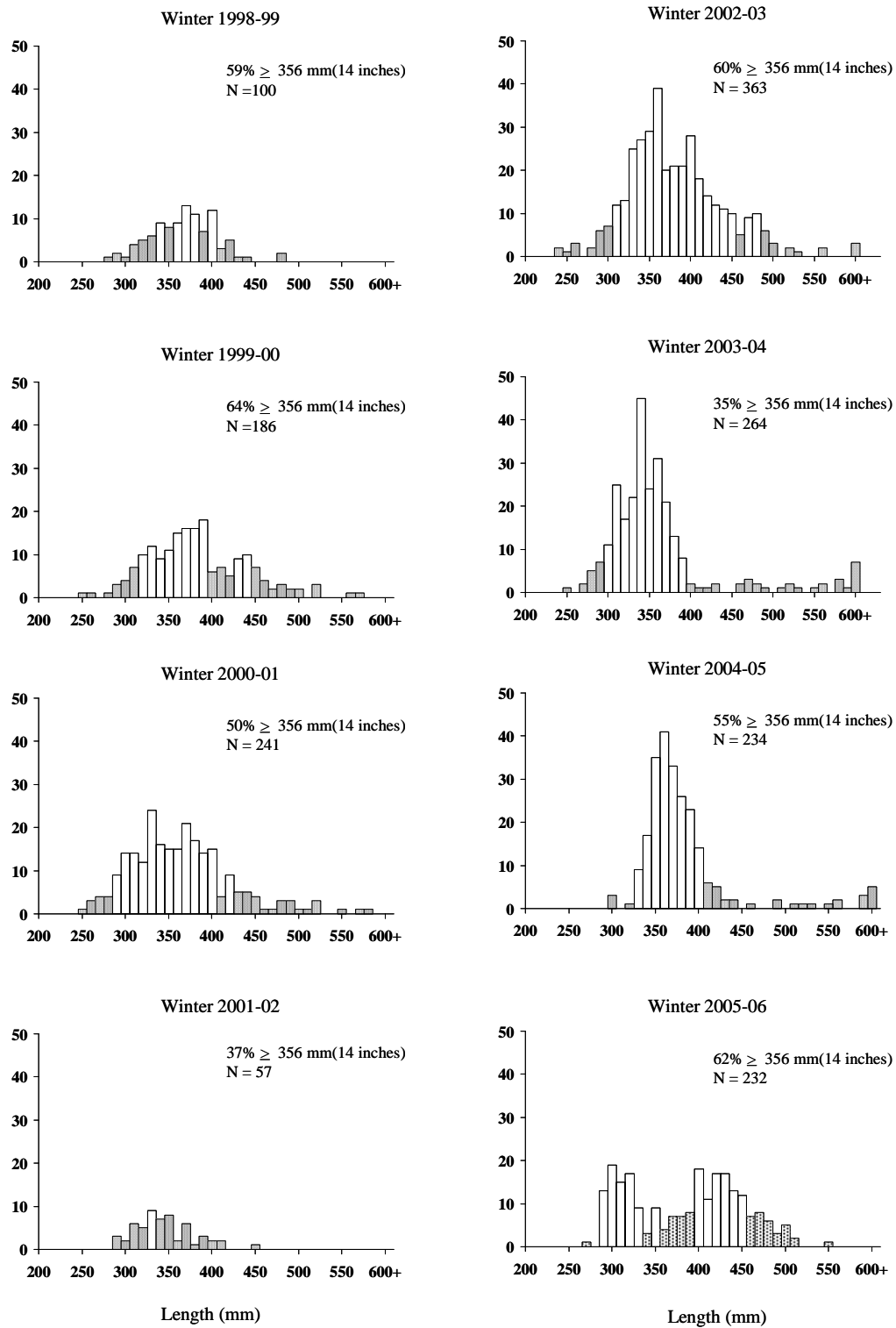


Figure 8. Length frequency of angler-harvested walleyes measured by the creel clerk during winter creel surveys on Lake Thompson, 1998-2006.

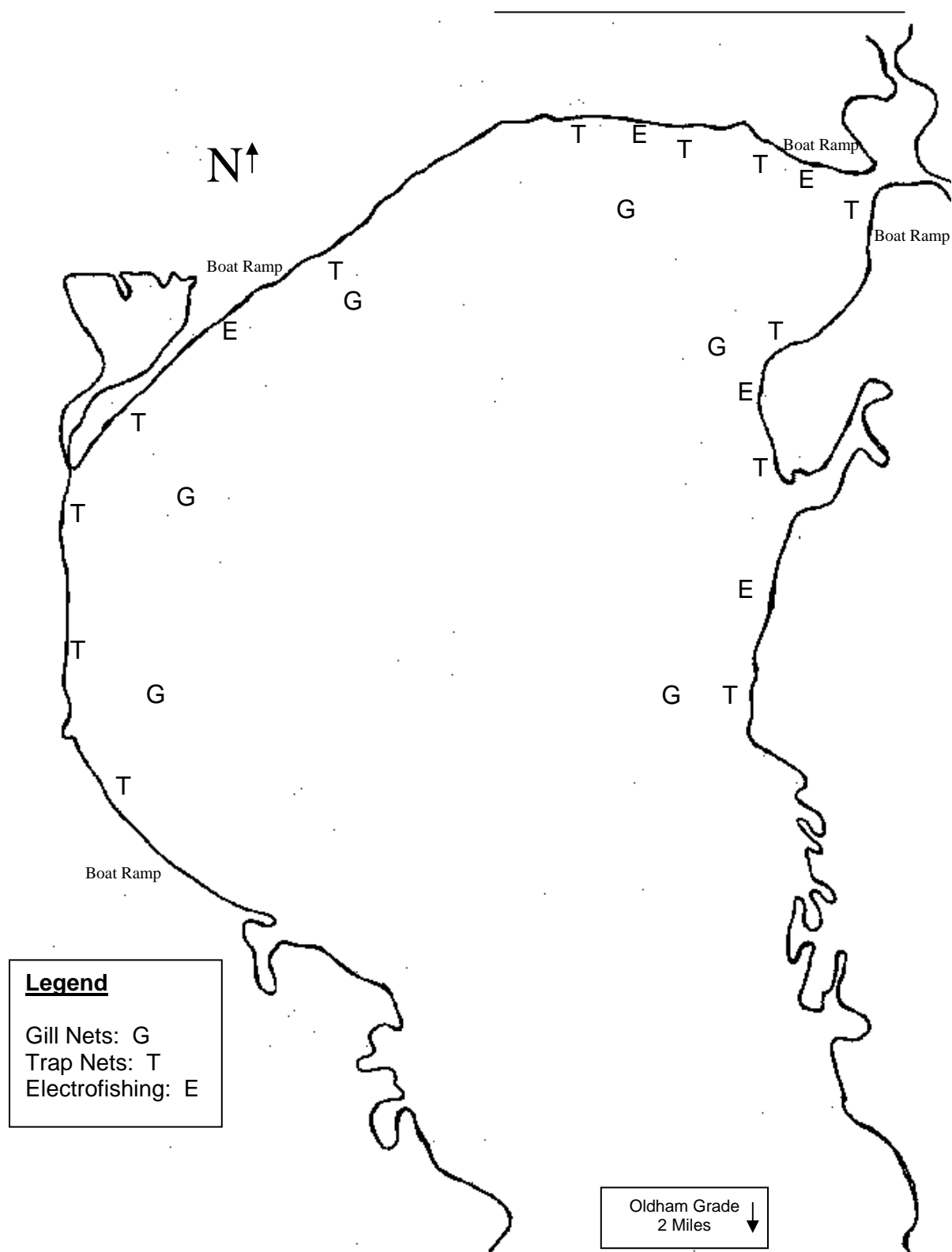


Figure 7. Sampling locations on Lake Thompson, 2006.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-39

Name: West 81 Lake **County:** Kingsbury
Legal Description: T109N-R53W-Sec.22-27, 34-36
Location from nearest town: 4 miles south of Arlington, SD
Dates of present survey: August 21-23, 2006
Date last surveyed: August 23-25, 2004

Primary Game and Forage Species	Secondary and Other Species
Walleye	Northern Pike
Yellow Perch	Black Bullhead
Smallmouth Bass	Yellow Bullhead
Largemouth Bass	White Bass
	Muskellunge

PHYSICAL DATA

Surface Area: 1,590 acres **Watershed area:** No data
Maximum depth: No data **Mean depth:** No data
Volume: No data **Shoreline length:** No data
Contour map available: No, shoreline only **Date mapped:** 2000 (SDSU)
Lake elevation observed during the survey: 3 feet low
Beneficial use classifications: fish and wildlife propagation and stocking watering

Ownership of Lake and Adjacent Lakeshore Property

The original lake basin for West 81 Lake, known as Brush/Twin Lakes, is listed as meandered public water in the State of South Dakota Listing of Meandered Lakes. The fishery in West 81 Lake is managed by the South Dakota Department of Game, Fish, and Parks (GFP). Part of the western end of the lake lies within a Waterfowl Production Area (WPA) owned and managed by the United States Fish and Wildlife Service (USFWS). The remainder of the shoreline, other than public road right-of-ways, is privately owned.

Fishing Access

There are no boat ramps on West 81 Lake, but boats can be launched off the county road right-of-way on the southwest corner of the lake. Shore fishing access is limited to public road right-of-ways.

Field Observations of Water Quality and Aquatic Vegetation

The water in West 81 Lake was fairly clear with a Secchi depth measurement of 1m (39.4 in). Large beds of clasping leaf pondweed (*Potamogeton richardsonii*), coontail (*Ceratophyllum demersum*), and sago pondweed (*Potamogeton pectinatus*) were found around the entire lake.

BIOLOGICAL DATA

Methods:

West 81 Lake was sampled on August 21-23, 2006 with two overnight gill net sets and nine overnight trap net sets. The trap nets are constructed with 19-mm-bar-mesh ($\frac{3}{4}$ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh ($\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, and 2 in) monofilament netting. Sampling locations are displayed in Figure 2.

Results and Discussion:

Gill Net Catch

Walleye (52.8%) and yellow perch (42.7%) were the most abundant species sampled in the gill nets this year (Table 1). White bass, smallmouth bass and northern pike were also sampled.

Table 1. Total catch from two overnight gill net sets at West 81 Lake, Kingsbury County, August 21-23, 2006.

Species	Number	Percent	CPUE¹	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Walleye	130	52.8	65.0	<u>+3.8</u>	6.4	23	6	95
Yellow Perch	105	42.7	52.5	<u>+66.0</u>	82.8	--	--	--
White Bass	7	2.8	3.5	<u>+1.9</u>	0.0	--	--	--
Smallmouth Bass	2	0.8	1.0	<u>+1.3</u>	0.0	--	--	--
Northern Pike	2	0.8	1.0	<u>+0.0</u>	3.6	--	--	--

* Three years (2000, 2002, 2004).

Trap Net Catch

Yellow bullheads (45.9%), green sunfish (17.6%), and walleye (15.3%) were the most common species in the trap-net catch (Table 2). Low numbers of black bullhead, largemouth bass, bluegill, northern pike, and smallmouth bass were also sampled. Overall catch per trap net was low due to dense vegetation restricting fish movement.

¹ See Appendix A for definitions of CPUE, PSD, and mean Wr.

Table 2. Total catch from nine overnight trap net sets at West 81 Lake, Kingsbury County, August 21-23, 2006.

Species	Number	Percent	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Yellow Bullhead	39	45.9	4.3	± 2.3	1.1	95	69	105
Green Sunfish	15	17.6	1.7	± 2.0	0.0	0	0	110
Walleye	13	15.3	1.4	± 0.8	2.4	--	--	--
Black Bullhead	6	7.1	0.7	± 0.5	680.7	--	--	--
Largemouth Bass	6	7.1	0.7	± 0.6	0.0	--	--	--
Bluegill	3	3.5	0.3	± 0.3	0.0	--	--	--
Northern Pike	2	2.4	0.2	± 0.2	0.6	--	--	--
Smallmouth Bass	1	1.2	0.1	± 0.1	0.0	--	--	--

* Three years (2000, 2002, 2004).

Walleye

Management objective: Maintain a walleye population with a gill-net CPUE of at least 15, a PSD range of 30-60, and a growth rate of 14 inches by age-3.

The West 81 walleye population is currently dominated by age-0 and age-1 fish although fish from eight different year-classes (0-7 years old) were sampled (Table 4). The age-1 fish were produced by stocking in 2005 and the age -0 from natural reproduction in 2006. The walleyes were in good condition (Table 3) and growth is above regional, statewide and large lake averages with fish exceeding 40 cm (16 inches) before age-3 (Table 4). PSD should increase as the abundant age-0 and age-1 walleyes reach 38 cm (15 inches) in length.

Table 3. Walleye gill-net CPUE, PSD, RSD-P, and mean Wr for West 81 Lake, Kingsbury County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE				8.5		5.3		5.3		65.0	6.4
PSD				94		75		20		23	63
RSD-P				35		0		30		6	22
Mean Wr				96		97		93		95	95

*3 years (2000, 2002, 2004)

Table 4. Average back-calculated lengths (mm) for each age class of walleye in West 81 Lake, Kingsbury County, 2006.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2005	1	61	225							
2004	2	2	230	366						
2003	3	7	165	299	417					
2002	4	3	143	255	348	397				
2001	5	1	127	316	435	496	531			
2000	6	1	171	284	408	449	477	496		
1999	7	3	250	440	516	543	562	580	592	
All Classes		78	216	324	424	471	539	559	592	
Statewide Mean			168	279	360	425	490			
Region III Mean			173	281	367	435	517			
LLI Mean*			169	280	358	425	494			

*Large Lakes and Impoundments

Yellow Perch

Management objective: Maintain a yellow perch population with a gill-net CPUE of at least 50 and a PSD range of 30-60.

Yellow perch gill net CPUE exceeded our objective (Table 5) however, 98% of the sample was age-0 fish (Figure 1). Growth has been above the statewide mean in past surveys. No yellow perch scales were aged in 2006 since only two adult yellow perch were sampled.

Table 5. Yellow perch gill-net CPUE, PSD, RSD-P, and mean Wr for West 81 Lake, Kingsbury County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE				257		74.7		21.3		52.5	117.7
PSD				57		13		12		--	27
RSD-P				2		3		5		--	3
Mean Wr				95		101		99		--	98

*3 years (2000, 2002, 2004)

Black and Yellow Bullhead

Black bullhead trap-net CPUE was very low in 2006 (Table 2). Yellow bullheads outnumbered black bullheads in the trap net catch, although neither species was very abundant (Table 6). The size structure and condition of both species was very good with some specimens reaching 38-43 cm (15-17 in) in length. The state record yellow bullhead was caught in West 81 Lake on September 3, 2006 and weighed 3 pounds 3 ounces.

All Species

After four lake surveys, only nine species have been found in West 81 Lake. Bluegill, smallmouth bass and largemouth bass have been introduced and were sampled in 2006. Muskies were stocked in 2005 and 2006 (Table 7) but have not been caught in our surveys, yet. No rough fish have been sampled in West 81 Lake (Table 6).

Table 6. Gill-net (GN) and trap-net (TN) CPUE for all fish species sampled in West 81 Lake, Kingsbury County, 1997-2006.

Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
NOP (GN)				5.0		5.7		--		1.0
NOP (TN)				--		--		1.7		0.2
WAE (GN)				8.5		5.3		5.3		65.0
WAE (TN)				--		1.4		3.3		1.4
YEP (GN)				152.5		74.7		21.3		52.5
YEP (TN)				32.2		5.7		0.1		--
BLB (GN)				110.5		25.0		--		--
BLB (TN)				976.0		1,065.4		0.6		0.7
YEB (GN)				--		--		--		--
YEB (TN)				--		--		3.4		4.3
GSF (GN)				--		--		--		--
GSF (TN)				--		--		--		1.7
LMB (GN)				--		--		--		--
LMB (TN)				--		--		--		0.7
SMB (GN)				--		--		--		1.0
SMB (TN)				--		--		0.1		0.1
BLG (GN)				--		--		--		--
BLG (TN)				--		--		--		0.3

NOP (Northern Pike), WAE (Walleye), YEP (Yellow Perch), BLB (Black Bullhead), YEB (Yellow Bullhead), GSF (Green Sunfish), LMB (Largemouth Bass), SMB (Smallmouth Bass), BLG (Bluegill)

MANAGEMENT RECOMMENDATIONS

1. Stock walleye fry or fingerlings to supplement natural production as needed to achieve management objective.
2. Investigate the possibility of developing an access area on the lake.
3. Conduct another lake survey in 2008 to monitor the fishery.

Table 7. Stocking record for West 81 Lake, Kingsbury County, 1999-2006.

Year	Number	Species	Size
1999	2,500,000	Walleye	Fry
2002	1,250,000	Walleye	Fry
2003	20,800	Bluegill	Fingerling
	25,140	Largemouth Bass	Fingerling
	56,900	Smallmouth Bass	Fingerling
	185,900	Walleye	Fingerling
2004	77,055	Largemouth Bass	Fingerling
2005	1,500	Muskellunge	Juvenile
	154,300	Walleye	Fingerling
2006	905	Muskellunge	Juvenile
	139	Smallmouth Bass	Adult

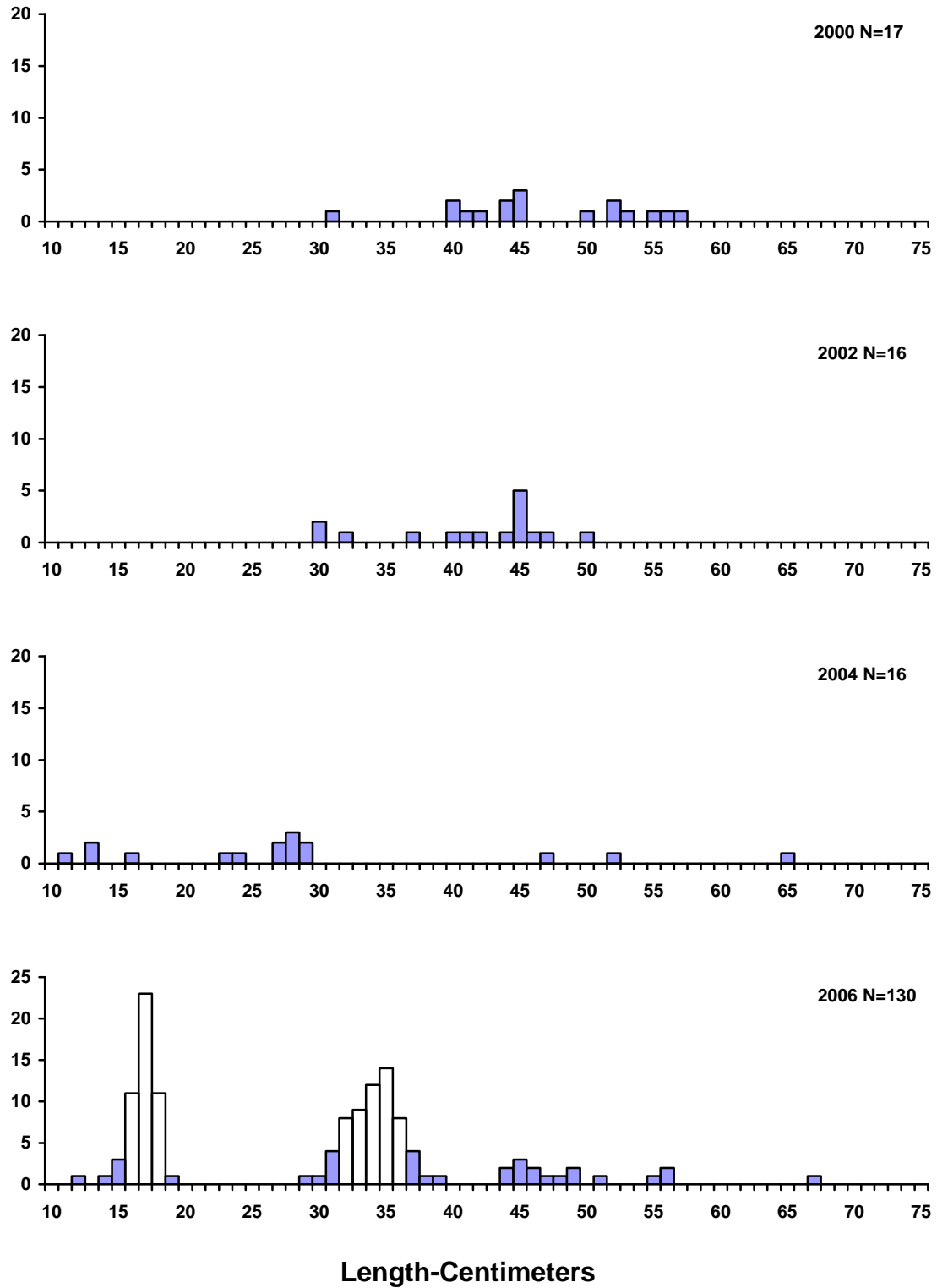


Figure 1. Length frequency histograms for walleye sampled with gill nets in West 81 Lake, Kingsbury County, 2000, 2002, 2004 and 2006.

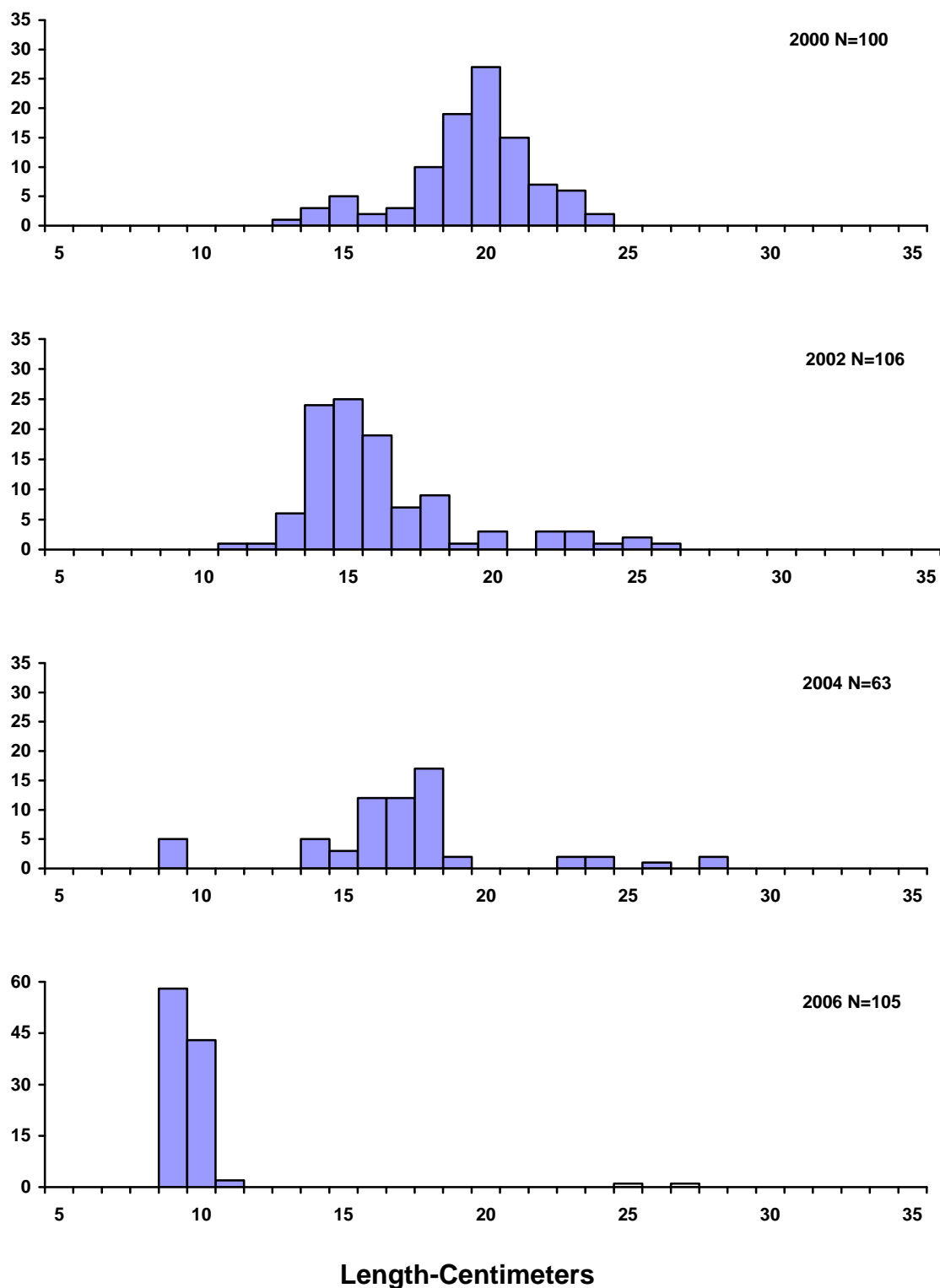


Figure 2. Length frequency histograms for yellow perch sampled with gill nets in West 81 Lake, Kingsbury County, 2000, 2002, 2004 and 2006.

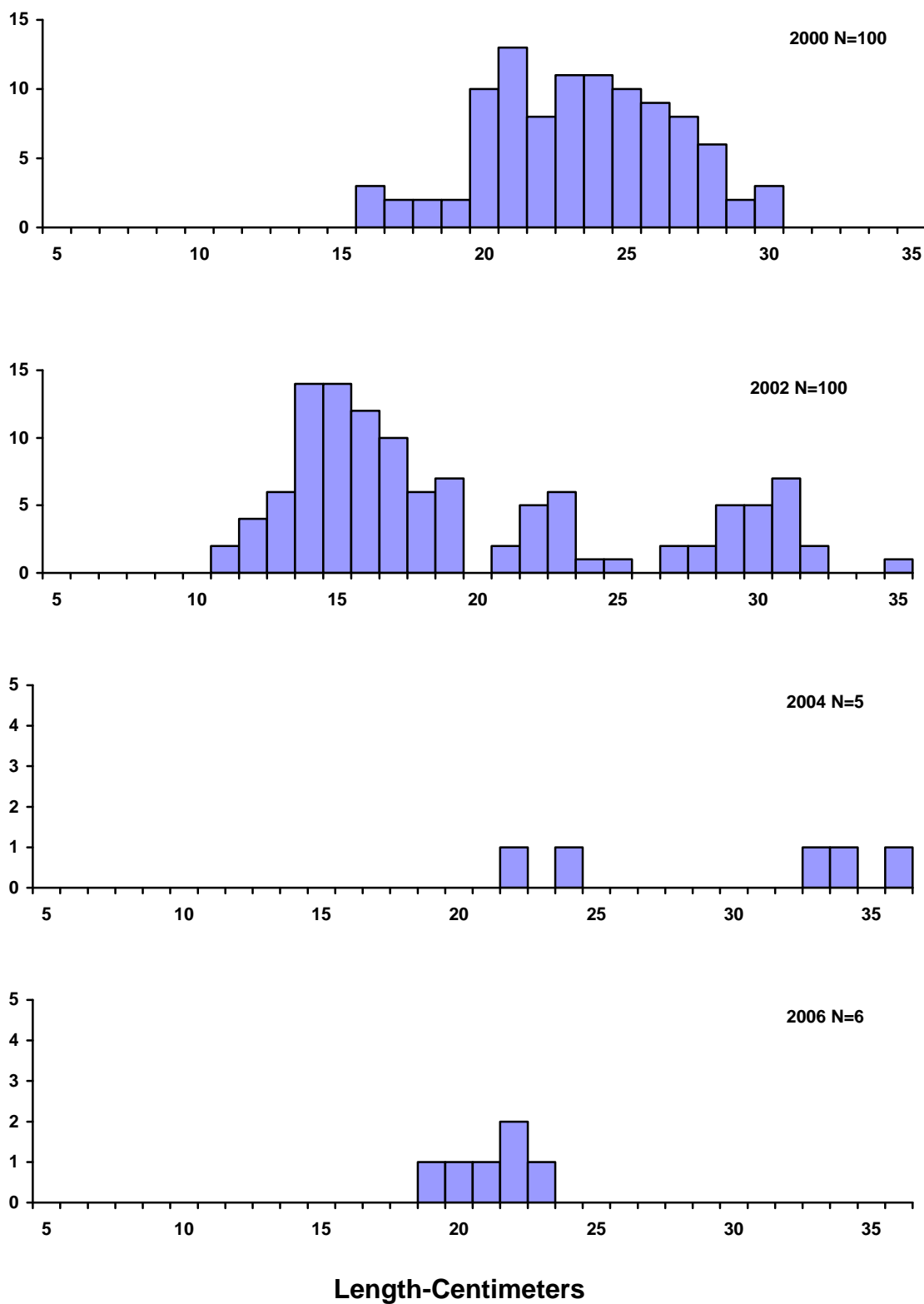
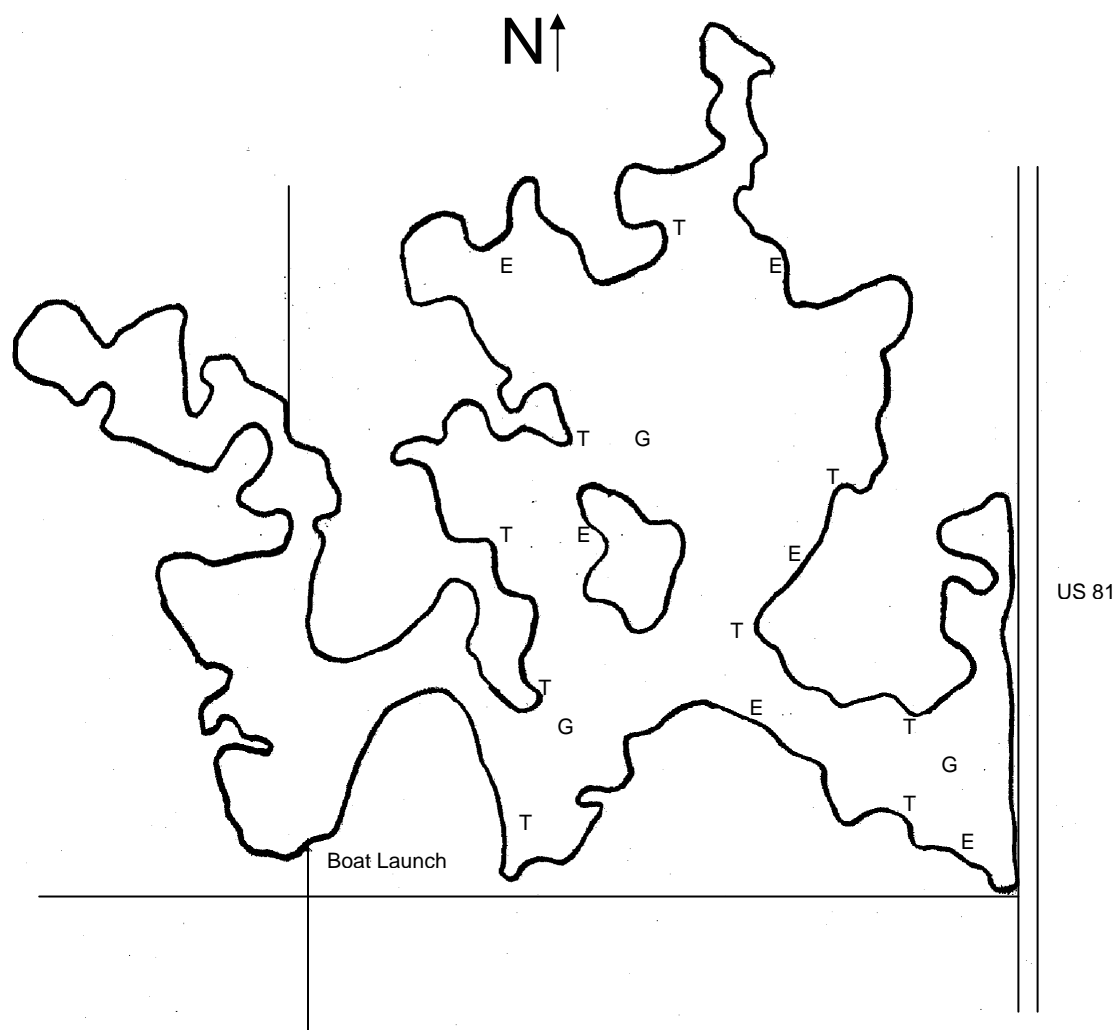


Figure 3. Length frequency histograms for black bullhead sampled with trap nets in West 81 Lake, Kingsbury County, 2000, 2002, 2004 and 2006.



Legend
Gill Nets: G
Trap Nets: T
Electrofishing: E

Figure 4. Sampling locations on West 81 Lake, 2006.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-39

Name: Whitewood Lake

County: Kingsbury

Legal Description: T110N- R54W-Sec. 2, 3, 9-21; T110N- R53W-Sec.18-19

Location from nearest town: 3-1/2 miles south, 1/2 east of Lake Preston, SD

Dates of present survey: August 7-9, 2006

Date last surveyed: August 10-11, 2004

Primary Game and Forage Species	Other Species
Walleye	Northern Pike
Yellow Perch	Black Crappie
	Black Bullhead
	Carp
	White Sucker
	Bigmouth Buffalo

PHYSICAL DATA

Surface Area: 4,677 acres

Maximum depth: 7 feet

Volume: No data

Contour map available: Yes

OHWM elevation: None set

Outlet elevation: None set

Lake elevation observed during the survey: 4 feet low

Beneficial use classifications: (6) warmwater marginal fish propagation, (7) immersion recreation, (8) limited-contact recreation and (9) fish and wildlife propagation and stock watering.

Watershed area: 106,134 acres

Mean depth: 3.8 feet

Shoreline length: 20.4 miles

Date mapped: 1990

Date set: NA

Date set: NA

Ownership of Lake and Adjacent Lakeshore Property

Whitewood Lake is listed as meandered public water in the State of South Dakota Listing of Meandered Lakes. The entire shoreline is privately owned with the exception of a lake access area owned by The South Dakota Department of Game, Fish, and Parks (GFP) on the southwest corner of the lake and some Kingsbury County road right-of-way on the south end.

Fishing Access

The Whitewood Lake Access Area has a single lane boat ramp, dock, parking lot, and public toilet. Shore fishing is available in the access area and along the county road right-of-way.

Field Observations of Water Quality and Aquatic Vegetation

The water in Whitewood Lake was very turbid during the survey with a Secchi depth of only 13 cm (5 in). No vegetation was observed during the survey.

BIOLOGICAL DATA

Methods:

Whitewood Lake was sampled on August 7-9, 2006 with two overnight gill net sets and ten overnight trap net sets. The trap nets are constructed with 19-mm-bar-mesh ($\frac{3}{4}$ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh ($\frac{1}{2}$, $\frac{3}{4}$, 1, 1 $\frac{1}{4}$, 1 $\frac{1}{2}$, and 2 in) monofilament netting. Sampling sites are displayed in Figure 2.

Results and Discussion:

Gill Net Catch

Common carp (39.3%), yellow perch (39.0%) and black bullhead (19.2%) were the most common species sampled in the gill nets (Table 1). Northern pike and white sucker were also present.

Table 1. Total catch from three overnight gill net sets at Whitewood Lake, Kingsbury County, August 7-9, 2006.

Species	Number	Percent	CPUE ¹	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Common Carp	125	39.3	62.5	± 0.6	7.8	43	2	87
Yellow Perch	124	39.0	62.0	± 21.8	90.1	92	50	106
Black Bullhead	61	19.2	30.5	± 14.7	50.2	33	0	81
Northern Pike	7	2.2	3.5	± 1.9	6.2	--	--	--
White Sucker	1	0.3	0.5	± 0.6	5.5	--	--	--

* 5 years (1996, 1998, 2000, 2002, 2004)

Trap Net Catch

Black bullheads (75.5%) dominated the trap-net sample. White sucker, common carp, yellow perch, and northern pike were also caught (Table 2).

Table 2. Total catch from five overnight trap net sets at Whitewood Lake, Kingsbury County, August 7-9, 2006.

Species	Number	Percent	CPUE	80%	Mean	PSD	RSD-P	Mean
---------	--------	---------	------	-----	------	-----	-------	------

¹ See Appendix A for definitions of CPUE, PSD, RSD-P, and mean Wr.

				C.I.	CPUE*			Wr
Black Bullhead	1,707	75.5	170.7	± 74.2	606.3	31	1	79
White Sucker	277	12.3	27.7	± 9.7	26.2	97	96	83
Common Carp	175	7.7	17.5	± 8.0	13.1	79	39	89
Yellow Perch	51	2.3	5.1	± 2.6	10.3	100	76	104
Northern Pike	50	2.2	5.0	± 3.6	10.2	66	10	93

* 5 years (1996, 1998, 2000, 2002, 2004)

Yellow Perch

Management objective: Maintain a yellow perch population with a gill-net CPUE of at least 50 with a PSD range of 30-60.

Yellow perch gill-net CPUE, PSD and RSD-P remain high indicating a good population of large fish (Table 3). About 50% and 15% of the yellow perch sampled were longer than 25 cm (10 in) and 30 cm (12 in), respectively (Figure 1). However, few yellow perch less than 20 cm (8 inches) were sampled suggesting poor reproduction in recent years. Without future recruitment, yellow perch numbers will continue to decline from angler harvest by ice fishermen and natural mortality.

Table 3. Yellow perch gill-net CPUE, PSD, RSD-P and mean Wr for Whitewood Lake, Kingsbury County, 1998-2006.

	1998	1999	2000	2001	2002	2003	2004	2005	2006
CPUE	32.3		87.0		115.3		117.7		62.0
PSD	43		20		6		97		92
RSD-P	15		4		0		67		50
Mean Wr	122		112		108		92		106

Black Bullhead

Management objective: Maintain a black bullhead population with a trap net CPUE of no more than 100.

Bullhead abundance has fluctuated since 1998 (Table 4). The majority (69%) of bullheads sampled were under 23 cm (9 in) long (Figure 3). There has been little recent recruitment, causing reduced CPUE and increased PSD.

Table 4. Black bullhead trap-net CPUE, PSD, RSD-P and mean Wr in Whitewood Lake, Kingsbury County, 1998-2006.

	1998	1999	2000	2001	2002	2003	2004	2005	2006
CPUE	17.7		1,574.8		398.6		823.2		170.7
PSD	5		2		5		3		31
RSD-P	0		0		0		0		1
Mean Wr	--		--		91		82		79

All Species

Low water levels and partial winterkills have apparently eliminated walleyes from Whitewood Lake (Table 5). Northern pike, yellow perch, black bullhead, and white sucker abundance has declined, while common carp abundance has increased.

Table 5. Gill-net (GN) and trap-net (TN) CPUE for all fish species sampled in Lake Whitewood, Kingsbury County, 1997-2006.

Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
NOP (GN)		9.8		4.0		13.7		0.3		3.5
NOP (TN)		11.2		5.6		17.1		14.4		5.0
WAE (GN)		19.0		19.0		--		--		--
WAE (TN)		26.5		11.9		1.1		--		--
BLC (GN)		1.8		0.7		2.7		--		--
BLC (TN)		5.7		23.0		6.3		2.0		--
YEP (GN)		32.3		87.0		115.3		117.7		62.0
YEP (TN)		0.4		6.4		5.4		8.6		5.1
BLB (GN)		0.8		79.0		81.7		86.0		30.5
BLB (TN)		17.7		1,574.8		398.6		823.2		170.7
BIB (GN)		--		--		0.3		--		--
BIB (TN)		0.1		0.3		0.1		0.2		--
COC (GN)		3.8		3.3		19.7		10.3		62.5
COC (TN)		13.6		12.7		10.6		5.2		17.5
SPS (GN)		--		0.3		--		--		--
SPS (TN)		--		--		--		--		--
WHS (GN)		0.8		5.7		9.7		11.0		0.5
WHS (TN)		0.7		9.0		87.7		32.4		27.7

NOP (Northern Pike), WAE (Walleye), BLC (Black Crappie), YEP (Yellow Perch), BLB (Black Bullhead), BIB (Bismouth Buffalo), COC (Common Carp), SPS (Spottail Shiner), WHS (White Sucker).

MANAGEMENT RECOMMENDATIONS

1. With less than five feet of water remaining in the lake, long-term fish survival doubtful. Short-term management efforts will involve monitoring the surviving gamefish populations and rescuing gamefish for stocking in other lakes if needed.

Table 6. Stocking record for Whitewood Lake, Kingsbury County, 1986-2006.

Year	Number	Species	Size
1986	2,500,000	Walleye	Fry
	1,920,000	Northern Pike	Fry
	3,960	Black Crappie	Adult
1987	2,500,000	Walleye	Fry
1992	1,250,000	Northern Pike	Fry
	11,500	Northern Pike	Fry
	2,527,000	Walleye	Fry
1994	2,500,000	Walleye	Fry
1997	7,244,000	Walleye	Fry
	4,230	Yellow Perch	Adult
1998	4,970,000	Walleye	Fry
2001	5,000,000	Walleye	Fry

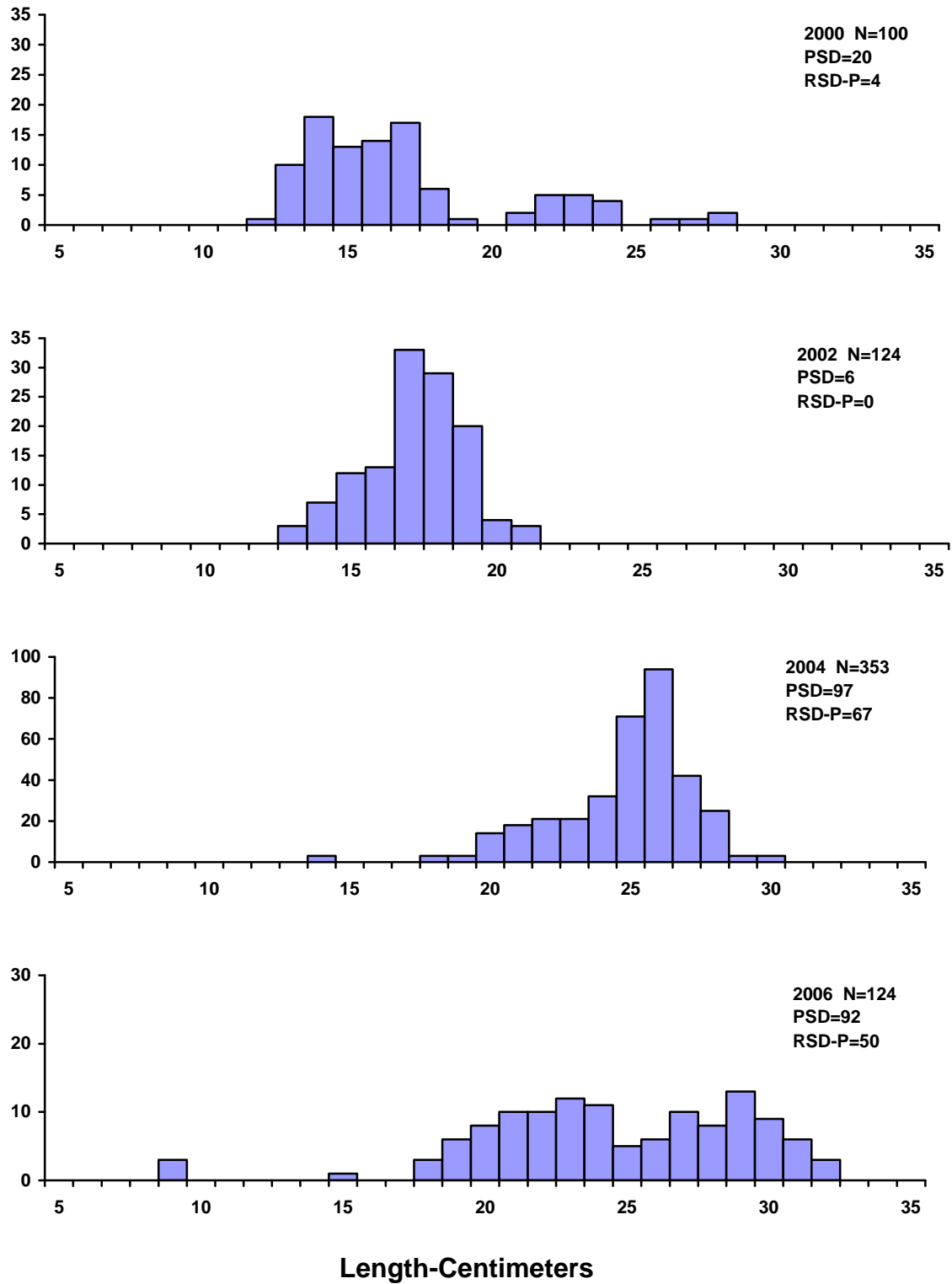


Figure 1. Length frequency histograms for yellow perch sampled with gill nets in Whitewood Lake, Kingsbury County, 2000, 2002, 2004 and 2006.

Legend

Trap-Net Sites: T
Gill Net Sites: G

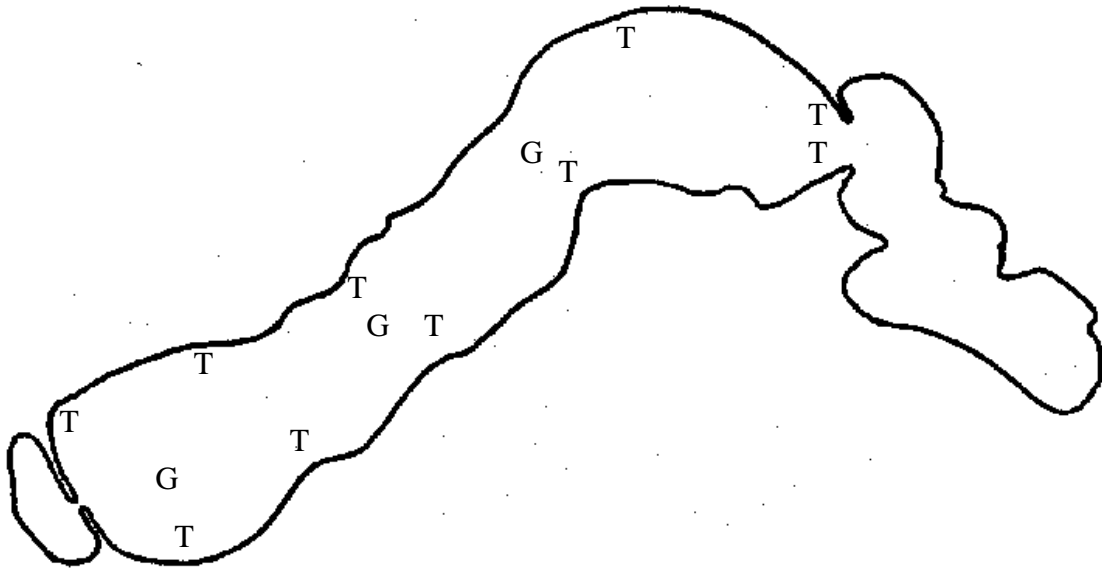


Figure 2. Sampling locations on Whitewood Lake, Kingsbury County, 2006.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-39

Name: Brant Lake

County: Lake

Legal Description: T105N- R51W-Sec. 3, 4, 9, 10

Location from nearest town: 2 miles north of Chester, SD

Dates of present survey: July 24-26, 2006 (netting); Sept. 16, 2006 (electrofishing)

Dates of last survey: July 28-30, 2005 (netting); Sept. 6, 2005 (electrofishing)

Primary Game Species	Other Species
Walleye	Northern Pike
Smallmouth Bass	Bluegill
Yellow Perch	Black Bullhead
Black Crappie	Channel Catfish
	Bigmouth Buffalo
	Common Carp
	White Sucker
	Spottail Shiner
	Green Sunfish
	Hybrid Sunfish

PHYSICAL DATA

Surface area: 1,037 acres

Maximum depth: 14 feet

Volume: 11,000 acre-feet

Contour map available: Yes

OHWL elevation: 1598.3

Outlet elevation: 1597.3

Lake elevation observed during the survey: Full

Beneficial use classifications: (4) warmwater permanent fish life propagation, (7) immersion recreation, (8) limited contact recreation and (9) wildlife propagation and stock watering.

Watershed area: 7,658 acres

Mean depth: 11 feet

Shoreline length: 6.2 miles

Date mapped: November, 2002

Date set: December, 1981

Date set: February, 1987

Introduction

Brant Lake, located just north of Chester, is fourth in a chain of four natural lakes formed by receding glaciers at the end of the last ice age. It derived its name from the large number of white brant (snow geese) that occupy the area during the spring and fall migrations. Brant receives most of its water from lakes Herman, Madison and Round, the upper three lakes in the chain, via Silver Creek. Additional inputs come from the relatively small, local watershed. Outflows form the headwaters of Skunk Creek, which flows into the Big Sioux River in Sioux Falls.

Ownership of Lake and Adjacent Lakeshore Properties

Brant Lake is listed as meandered public water in the State of South Dakota Listing of Meandered Lakes and the South Dakota Department of Game, Fish and Parks (GFP) manages the fishery. GFP also owns and maintains access areas on the east, south, and west sides of the lake. The remainder of the shoreline property is privately owned.

Fishing Access

The East Brant Access Area has a double lane boat ramp, dock and large parking lot. The West Brant Access Area has a beach suitable for launching small boats with a 4-wheel drive vehicle and several shore fishing areas. The South Brant Access Area also offers shore fishing opportunities.

Field Observations of Water Quality and Aquatic Vegetation:

In spite of a moderate algae bloom, water clarity was good this year with a Secchi depth measurement of 107 cm (42 in). Scattered beds of sago pondweed (*Potamogeton pectinatus*) were found throughout the lake and cattails (*Typha spp.*) were observed at the west end.

BIOLOGICAL DATA

Methods:

Brant Lake was sampled on July 24-26, 2006 with four overnight gill-net sets and 11 overnight trap-net sets. The trap nets are constructed with 19-mm-bar-mesh ($\frac{3}{4}$ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh ($\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, and 2 in) monofilament netting. Two hours of nighttime electrofishing were done on September 16, 2006 to evaluate walleye recruitment. Sampling locations are displayed in Figure 8.

Results and Discussion:

Gill Net Catch

Bigmouth buffalo (20.9%), yellow perch (19.5%), smallmouth bass (17.6%), black bullhead (13.6%) and walleye (13.6%) were most abundant in the gill nets (Table 1). Six additional species were also sampled.

Table 1. Total catch from four overnight gill-net sets at Brant Lake, Lake County July 24-26, 2006.

Species	#	%	CPUE ¹	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Bigmouth Buffalo	77	20.9	19.3	± 16.2	0.4	2	0	113
Yellow Perch	72	19.5	18.0	± 8.1	40.1	60	39	103
Smallmouth Bass	65	17.6	16.3	± 3.2	2.5	4	4	103
Black Bullhead	50	13.6	12.5	± 6.1	6.8	19	4	106
Walleye	50	13.6	12.5	± 2.8	16.6	44	5	85
White Sucker	35	9.5	8.8	± 3.6	7.6	100	91	103
Black Crappie	8	2.2	2.0	± 1.7	1.8	--	--	--
Bluegill	5	1.4	1.3	± 1.0	0.3	--	--	--
Spottail Shiner	3	0.8	0.8	± 0.6	0.6	--	--	--
Northern Pike	3	0.8	0.8	± 0.6	0.7	--	--	--
Common Carp	1	0.3	0.3	± 0.3	1.0	--	--	--

* (11 years) 1995-2005

Trap Net Catch

Smallmouth bass (39.1%) dominated the trap-net catch (Table 2). Black bullhead (20.5%) and bigmouth buffalo (16.7%) were next in abundance. Nine other species were also sampled.

Table 2. Total catch from 11 overnight trap-net sets at Brant Lake, Lake County July 24-26, 2006.

Species	#	%	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Smallmouth Bass	566	39.1	51.5	± 19.7	9.7	10	5	93
Black Bullhead	297	20.5	27.0	± 12.5	20.3	38	23	93
Bigmouth Buffalo	242	16.7	22.0	± 11.1	1.3	24	0	113
Black Crappie	108	7.5	9.8	± 4.0	7.0	76	32	110
White Sucker	78	5.4	7.1	± 3.4	7.2	100	99	96
Bluegill	76	5.3	6.9	± 2.7	2.7	66	11	111
Common Carp	38	2.6	3.5	± 1.2	6.0	19	11	101
Walleye	18	1.2	1.6	± 0.9	2.0	40	0	83
Northern Pike	8	0.6	0.7	± 0.5	1.2	--	--	--
Yellow Perch	8	0.6	0.7	± 0.5	4.8	--	--	--
Channel Catfish	6	0.4	0.5	± 0.4	0.4	--	--	--
Green Sunfish	1	0.1	0.1	± 0.1	0.0	--	--	--

* 11 years (1995-2005)

Walleye

Management objective: Maintain a walleye population with a gill-net CPUE of at least 20, a PSD range of 30-60, and a growth rate of 14 inches by age-3.

¹ See Appendix A for definitions of CPUE, PSD, RSD-P, and mean Wr.

Walleye gill-net CPUE increased but still remains below the management objective (Table 3). The increase can be contributed to a moderately-successful fry stocking in 2005 and the migration of fingerlings from Lake Madison to Brant, also in 2005. PSD decreased because some age-1 fish (Figure 1) were longer than 25 cm (10 in) when sampled. Walleye condition (Wr) remains consistent with previous years (Table 3).

Overall, walleye growth is slightly below statewide, regional and large lakes means (Table 4). The larger 2001 year class grew slower than average, however, the smaller 2002 and 2003 year classes and the moderate 2005 year class grew similar to or better than average (Table 4).

Table 3. Walleye gill-net CPUE, PSD, RSD-P, and mean Wr for Brant Lake, Lake County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	15.2	11.2	19.3	21.3	20.5	20.7	12.8	12.3	8.5	12.5	16.9
PSD	15	15	12	9	38	82	13	4	59	44	29
RSD-P	2	0	1	0	4	0	6	2	0	5	2
Mean Wr	90	84	82	89	93	83	81	86	84	85	86

*10 years (1996-2005)

Table 4. Average back-calculated lengths (mm) for each age class of walleye in Brant Lake, Lake County, 2006.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2005	1	26	204							
2004	2	2	158	195						
2003	3	6	183	300	372					
2002	4	7	177	285	351	393				
2001	5	6	174	274	339	396	433			
2000	6	1	209	352	402	423	457	471		
1999	7	1	156	228	283	361	433	466	487	
1997	9	1	146	236	353	444	508	581	631	669
All Classes		50	190	277	353	397	444	506	559	669
Statewide Mean			168	279	360	425	490			
Region III Mean			173	281	367	435	517			
LLI* Mean			169	280	358	425	494			

*Large Lakes and Impoundments (>150 acres)

Walleye fingerlings marked with oxytetracycline (OTC) were stocked in 2006 (Table 18) and fall electrofishing indicated a moderately-strong year class was produced. Fingerling marks were present on 73% of the fish examined indicating that stocking contributed nearly 90 age-0 walleyes/h to the electrofishing catch (Table 5). Age-0 walleye length and condition were similar to previous years.

Table 5. Nighttime electrofishing CPUE for age-0 and age-1 walleyes in Brant Lake, Lake County, 1996-2006.

Year	Stocking	Age-0 CPH	80% C.I.	% stocked	Mean length (range; mm)	Wr	Age-1 CPH	80% C.I.	Mean length (range; mm)	Wr
2006	fingerling	124	98-150	73	170 (136-188)	90	11	(4-18)	290 (255-324)	88
2005	fry	62 ¹	51-73	45	174 (138-209)	94	0	--	--	--
2004	none	0	--		--	--	2	0-3	266 (236-288)	89
2003	none	20	14-26		176 (156-181)	101	8	6-10	265 (228-274)	89
2002	none	42	21-63		164 (140-183)	98	166	112-219	248 (208-268)	86
2001	none	84	49-118		154 (131-198)	86	1	0-2	319	
2000	none	24	18-30		184 (161-217)	101	5	3-7	295 (269-305)	101
1999	none	86			162 (140-217)		35			
1998	fry	176		98	137 (116-132)		23			
1997	fry	178		93	124 (102-190)		58			
1996	fry	79		92	137 (116-186)		34			

¹ OTC marking revealed that 50% of the age-0 walleyes electrofished from Brant Lake were 2005 fingerling-stocked Lake Madison walleyes that had migrated downstream with the late-summer, high-water conditions (fish exhibited bright fingerling marks).

Yellow Perch

Management objective: Maintain a yellow perch population with a gill-net CPUE of at least 30 and a PSD range of 30-60.

Yellow perch gill-net CPUE dropped to 18.0, well below the management objective (Table 6). The size structure of the population is excellent and the fish are in very good condition (Table 6; Figure 2). Growth remains better than statewide, regional, and large lake means (Table 7). Some reproduction is occurring each year, however, a strong year class has not been produced since 2001.

Table 6. Yellow perch gill-net CPUE, PSD, and mean Wr for Brant Lake, Lake County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	11.7	18.4	32.0	28.0	42.8	124.7	76.6	50.0	28.3	18.0	42.9
PSD	68	96	67	82	8	93	94	98	63	60	73
RSD-P	17	55	33	28	0	3	15	86	53	39	29
Mean Wr	109	101	97	106	93	99	101	102	102	103	102

*10 years (1996-2005)

Table 7. Average back-calculated lengths (mm) for each age class of yellow perch in Brant Lake, Lake County, 2006.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2005	1	32	115							
2004	2	10	96	191						
2003	3	7	98	182	230					
2002	4	1	87	191	224	244				
2001	5	18	96	175	240	266	281			
2000	6	4	98	163	217	251	273	288		
All Classes		72	98	180	228	254	277	288		
Statewide Mean			86	145	190	220	242			
Region III Mean			94	159	208	242	281			
LLI Mean			86	146	192	225	249			

Smallmouth Bass

Management objective: No management objectives have been set because current sampling techniques are relatively unreliable.

Smallmouth bass trap-net CPUE increased this year and is the highest seen since they were introduced in the mid 1980's (Table 8). A very strong year class was produced in 2005 and comprised over 60% of the catch. Other year classes, not seen in previous surveys, were sampled in higher numbers this year. Most of the bass sampled were 13-42 cm (5.0-16.5 in) long (Figure 3) and five consecutive year classes were present indicating consistent natural reproduction (Table 9). Growth is faster than statewide, regional and large lake means (Table 9).

Table 8. Smallmouth bass trap-net CPUE, PSD, RSD-P, and mean Wr from Brant Lake, Lake County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	2.9	8.2	18.9	4.2	14.0	22.0	5.0	8.7	2.6	51.5	10.5
PSD	8	10	0	10	35	5	6	19	42	10	14
RSD-P	0	0	0	2	8	0	0	1	17	5	3
Mean Wr	97	86	96	107	103	118	94	103	102	93	101

*10 years (1996-2005)

Table 9. Average back-calculated lengths (mm) for each age class of smallmouth bass in Brant Lake, Lake County, 2006.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2005	1	379	114							
2004	2	126	103	157						
2003	3	40	111	204	249					
2002	4	16	123	212	272	314				
2001	5	10	107	198	289	358	396			
All Classes		571	111	193	270	336	396			
Statewide Mean			91	171	242	300	333			
Region III Mean			107	187	237	322				
LLI Mean			92	169	237	304	335			

Black Crappie

Management objective: Maintain a black crappie population with a trap-net CPUE of at least 10 and a PSD of at least 60.

Black crappie trap-net CPUE exceeded the 10-year mean in 2006 but fell just short of our management objective (Table 10). A large number of age-3 fish (2003 year class) were sampled and large year classes were also produced in 2004 and 2005 following two years of poor reproduction (Table 11; Figure 4). Examination of previous data showed that few crappies were produced in Brant back in 2003. However, since Lake Madison did produce a strong year class in 2003, we've concluded some of these fish migrated into Brant. Brant Lake crappies grow faster than statewide, regional and large lake means (Table 11) and the length-frequency histograms in Figure 4 show three distinct year classes.

Table 10. Black crappie trap-net CPUE, PSD, RSD-P, and mean Wr from Brant Lake, Lake County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	6.6	3.3	4.7	4.3	8.1	11.8	23.2	3.9	8.8	9.8	7.6
PSD	91	100	61	100	97	81	100	100	35	76	83
RSD-P	33	62	14	35	23	0	25	98	26	32	33
Mean Wr	114	109	118	114	121	113	104	99	116	110	112

*10 years (1996-2005)

Table 11. Average back-calculated lengths (mm) for each age class of black crappie in Brant Lake, Lake County, 2006.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2005	1	23	97							
2004	2	22	83	179						
2003	3	51	105	188	236					
2002	4	8	110	180	213	253				
2001	5	3	95	202	256	285	299			
2000	6	1	87	188	218	233	265	283		
All Classes		108	96	187	231	257	282	283		
Statewide Mean			83	147	195	229	249			
Region III Mean			95	167	219	253	274			
LLI Mean			89	161	210	247	271			

Black Bullhead

Management objective: Maintain a black bullhead population with a trap-net CPUE of 100 or less.

The Brant Lake bullhead CPUE increased in 2006 due to year classes produced in 2004 and 2005 (Table 12). The size structure of the population is comprised mostly of mid-size fish with an average length of 240 mm (9.4 inches) (Figure 5). Trap-net CPUE is still within our management objective of 100 or less.

Table 12. Black bullhead trap-net CPUE, PSD, RSD-P, and mean Wr for Brant Lake, Lake County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	15.7	0.4	1.8	3.1	6.0	15.0	147.5	11.3	9.1	27.0	23.3
PSD	76	--	100	100	94	17	91	100	98	38	85
RSD-P	1	--	23	8	42	6	1	7	44	23	17
Mean Wr	--	--	86	84	85	92	102	88	92	93	90

*9 years (1997-2005)

All Species

Common carp trap-net CPUE declined this year, probably due to the die-off (Table 13). The white sucker CPUE increased ten-fold.

Table 13. Gill-net (GN) and trap-net (TN) CPUE for all fish species sampled in Brant Lake, Lake County, 1996-2005.

Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CCF (GN)	0.5	0.2	0.5	0.3	--	--	1.2	1.5	2.0	--
CCF (TN)	0.2	0.4	--	0.1	--	--	2.6	0.6	0.3	0.5
NOP (GN)	0.5	0.8	--	0.5	0.3	1.0	--	0.8	0.3	0.8
NOP (TN)	2.2	0.8	2.3	0.3	0.6	2.1	0.5	0.7	--	0.7
SMB (GN)	--	--	2.8	1.3	3.3	7.0	4.4	3.8	3.5	16.3
SMB (TN)	2.9	8.2	18.9	4.2	14.0	22.2	5.0	8.7	2.6	51.5
WAE (GN)	15.2	11.2	19.3	21.3	20.5	20.7	12.8	12.0	8.5	12.5
WAE (TN)	2.5	1.5	0.9	0.5	3.2	1.5	2.0	2.3	1.1	1.6
WHB (GN)	--	--	--	--	--	--	--	--	0.5	--
WHB (TN)	--	--	--	--	0.1	--	--	0.1	--	--
BLC (GN)	0.5	--	0.3	0.7	--	7.7	3.0	2.8	5.3	2.0
BLC (TN)	6.6	3.3	4.7	4.3	8.1	11.8	23.2	3.9	8.8	9.8
BLG (GN)	--	0.8	--	--	0.3	1.3	0.6	--	0.3	1.3
BLG (TN)	0.2	0.8	0.3	1.3	3.3	8.8	4.4	4.1	6.8	6.9
GSF (GN)	--	--	--	--	--	--	0.2	--	--	--
GSF (TN)	--	--	--	--	0.1	0.1	--	0.3	--	0.1
HYB (GN)	--	--	0.3	--	--	--	0.4	--	--	--
HYB (TN)	--	--	0.2	--	0.7	0.5	0.5	--	--	--
WHC (GN)	--	--	--	--	--	--	--	--	--	--
WHC (TN)	0.1	--	--	--	--	--	--	--	--	--
YEP (GN)	11.7	18.4	32.0	28.0	42.8	124.7	76.6	50.0	28.3	18.0
YEP (TN)	1.6	2.0	1.3	5.4	17.7	8.5	8.3	0.7	0.2	0.7
BLB (GN)	19.2	7.8	3.0	1.5	0.5	6.0	17.2	5.0	9.0	12.5
BLB (TN)	15.7	0.4	1.8	3.1	6.0	15.0	147.5	11.3	9.1	27.0
BIB (GN)	--	0.2	--	--	--	--	0.2	--	3.3	19.3
BIB (TN)	2.0	0.2	1.3	0.2	1.8	3.9	1.5	0.2	0.3	22.0
COC (GN)	1.5	1.2	1.7	1.5	0.5	--	1.2	0.3	2.5	0.3
COC (TN)	4.7	2.4	2.8	4.1	1.2	7.7	2.2	17.8	4.8	3.5
COS (GN)	--	--	0.3	--	--	--	--	--	--	--
COS (TN)	--	--	--	--	--	--	--	--	--	--
SPS (GN)	--	0.2	--	0.8	0.3	2.3	--	0.3	--	0.8
SPS (TN)	--	--	--	--	--	--	--	--	--	--
WHS (GN)	9.0	1.6	2.3	3.2	6.0	4.3	10.6	17.0	8.5	8.8
WHS (TN)	4.7	3.2	3.7	0.6	2.6	5.1	3.5	4.5	45.1	7.1

CCF (Channel Catfish), NOP (Northern Pike), SMB (Smallmouth Bass), WAE (Walleye), WHB (White Bass), BLC (Black Crappie), BLG (Bluegill), GSF (Green Sunfish), HYB (Hybrid Sunfish), WHC (White Crappie), YEP (Yellow Perch), BLB (Black Bullhead), BIB (Bigmouth Buffalo), COC (Common Carp), COS (Common Shiner), SPS (Spottail Shiner), WHS (White Sucker)

Creel Survey Results

Winter 2005-06

Winter fishing pressure was low in 2005-06 (Table 16). Only one northern pike and two yellow perch were observed by the creel clerk during the entire survey (Table 17). About 26% of parties interviewed were targeting walleyes, nearly 48% were fishing for perch and 2% were targeting crappies.

Angling parties were asked their opinion on several regulation scenarios. About 37% of parties interviewed were in favor of reducing the statewide daily walleye limit from four to three with 49% opposed and 14% neutral towards the change. When asked their opinion on reducing the statewide panfish limit from 25 to 10, 44% favored the change, 12% were neutral and 44% were opposed. Only 23% of parties asked were in favor of reducing the pike limit from six to three with 33% neutral.

Summer 2006

Summer fishing pressure decreased from 2001-2005 levels, but was still higher than pressure observed in the late 1990s (Table 14). Fishing pressure was highest in June (8,948 h) followed by July (6,737 h). Eight different species were targeted by anglers; however, most (55%) were targeting walleyes. About 96% of parties interviewed were South Dakota residents.

Walleye catch rate rebounded in 2006, but the harvest rate approached a 9-year low (Table 15). Less than 25% of walleyes caught were harvested with most small fish (23-28 cm; 9-11 inches) were released. Of the walleyes kept, nearly 94% were at least 35.6 cm (14 inches) long.

Yellow perch harvest has continually decreased since 2002. The majority of yellow perch harvested were 5 years old and 25-33 cm (10-13 in) long.

Smallmouth bass and bluegill catch were at multi-year highs. Harvested bass ranged from 21-41 cm (8-16 in) in length. Twelve bluegills, 10-inches and longer, were measured by the creel clerk.

Table 14. Estimates of fishing pressure and catch (harvest) of fish on Brant Lake from May through August, 1998-2006.

Year	Pressure (h)	Walleye Catch (Harvest)	Bluegill Catch (Harvest)	Yellow Perch Catch (Harvest)	Black Crappie Catch (Harvest)	SM Bass Catch(Harvest)
2006	22,053	6,372 (1,618)	1,295 (691)	1,075 (525)	1,766 (1,150)	6,841 (1,087)
2005	31,760	5,022 (4,063)	502 (197)	1,821 (1,532)	684 (555)	1,466 (290)
2004	30,658	8,640 (4,855)	371 (354)	2,762 (2,596)	6,101 (5,710)	2,003 (727)
2003	28,220	34,715 (4,181)	388 (39)	11,301 (8,262)	9,686 (5,847)	5,146 (1,278)
2002	44,346	12,102 (3,368)	2,124 (993)	27,829 (21,437)	10,150 (4,284)	5,772 (1,335)
2001	29,843	6,878 (3,914)	0 (0)	598 (208)	528 (528)	1,479 (1,006)
2000	17,966	11,167 (2,795)	23 (23)	3,171 (2,536)	2,989 (1,023)	2,232 (131)
1999	13,634	9,609 (1,078)	0 (0)	1,220 (578)	306 (184)	2,180 (165)
1998	14,257	11,320 (591)	0 (0)	461 (299)	1,133 (674)	2,352 (201)

Table 15. Number of interviews and estimates of catch and harvest rates (number/hour) on Brant Lake from May through August, 1998-2006.

Year	Number of Interviews	Walleye Catch (Harvest)	Bluegill Catch (Harvest)	Yellow Perch Catch (Harvest)	Black Crappie Catch (Harvest)	SM Bass Catch (Harvest)
2006	257	0.29 (0.07)	0.06 (0.03)	0.05 (0.02)	0.08 (0.05)	0.31 (0.05)
2005	288	0.16 (0.13)	0.02 (0.006)	0.06 (0.05)	0.02 (0.02)	0.05 (0.009)
2004	464	0.28 (0.16)	0.01 (0.004)	0.09 (0.08)	0.20 (0.19)	0.07 (0.02)
2003	285	1.23 (0.15)	0.01 (0.001)	0.40 (0.29)	0.34 (0.21)	0.18 (0.05)
2002	448	0.27 (0.08)	0.05 (0.02)	0.63 (0.48)	0.23 (0.10)	0.13 (0.03)
2001	203	0.23 (0.13)	0 (0)	0.02 (0.01)	0.02 (0.02)	0.05 (0.03)
2000	164	0.62 (0.16)	0.001 (0.001)	0.18 (0.14)	0.17 (0.06)	0.12 (0.01)
1999	185	0.70 (0.08)	0 (0)	0.09 (0.04)	0.02 (0.01)	0.16 (0.01)
1998	190	0.79 (0.04)	0 (0)	0.03 (0.02)	0.08 (0.05)	0.17 (0.01)

Table 16. Estimates of fishing pressure and catch (harvest) of fish in Brant Lake from December through March, 2002-2006.

	Fishing Pressure (Hours)	Walleye Catch (Harvest)	Northern Pike Catch (Harvest)	Yellow Perch Catch (Harvest)	Black Crappie Catch (Harvest)	Bluegill Catch (Harvest)
2005-06	1,606	0 (0)	0 (0)	9 (9)	5 (0)	0 (0)
2004-05	1,561	0 (0)	5 (5)	0 (0)	0 (0)	0 (0)
2003-04	7,651	1,411 (782)	45 (39)	0 (0)	75 (34)	0 (0)
2002-03	8,098	5,032 (681)	44 (0)	519 (515)	146 (142)	28 (28)

Table 17. Number of angler interviews and estimates of hourly catch rate (harvest rate) of fish in Brant Lake from December through March, 2002-2006.

	Number of Interviews	Walleye Catch (Harvest)	Northern Pike Catch (Harvest)	Yellow Perch Catch (Harvest)	Black Crappie Catch (Harvest)	Bluegill Catch (Harvest)
2005-06	46	0 (0)	0 (0)	0.006 (0.006)	0.003 (0)	0 (0)
2004-05	58	0 (0)	0.003 (0.002)	0 (0)	0 (0)	0 (0)
2003-04	155	0.18 (0.10)	0.006 (0.005)	0 (0)	0.01 (0.005)	0 (0)
2002-03	151	0.62 (0.08)	0.005 (0)	0.06 (0.06)	0.02 (0.02)	0.003 (0)

MANAGEMENT RECOMMENDATIONS

1. Continue annual fish population and creel surveys to monitor the Brant Lake fishery.
2. Continue to electrofish Brant Lake each fall to monitor walleye reproduction and recruitment. Walleye fry or fingerlings will be stocked into voids of natural production.
3. Consider yellow perch stocking and spawning habitat enhancement to fill voids of poor reproduction. To enable stocking evaluations, adult perch should be fin clipped and fingerling perch should be marked with OTC prior to release. Marked fish will be monitored through annual lake surveys and creel surveys.
4. Larger smallmouth bass cannot be effectively sampled by fall electrofishing or summer trap netting. Investigate late spring electrofishing as a possible technique to collect larger fish so trends in abundance and size structure can be monitored.

5. Adult crappie stockings have been ineffective and were discontinued. Past research has indicated that a lack of wind protected spawning habitat may limit natural reproduction. Investigate the use of artificial structures to enhance spawning habitat and the use of barriers to protect crappie spawning areas from the destructive activities of common carp.
6. The Brant Lake Association has expressed interest in cooperating with GFP to work on habitat projects in the lake. We should develop a preliminary habitat improvement plan that includes Christmas trees for perch spawning and shoreline brush piles for crappie, bass and bluegill benefits.

Table 18. Stocking record for Brant Lake, Lake County, 1991-2006.

Year	Number	Species	Size
1991	2,000,000	Walleye	Fry
	100,000	Walleye	Sml. Fingerling
	10,000	Largemouth Bass	Med. Fingerling
1992	60,000	Fathead Minnow	Adult
	60,000	Smallmouth Bass	Fry
	100,000	Walleye	Sml. Fingerling
1993	50,500	Yellow Perch	Fingerling
	66,300	Black Crappie	Fingerling
	157	Black Crappie	Adult
	2,000,000	Walleye	Fry
	100,000	Walleye	Sml. Fingerling
1995	448	Walleye	Lrg. Fingerling
	50,000	Channel Catfish	Fingerling
	56,200	Fathead Minnow	Adult
	5,763	Yellow Perch	Adult
1996	11,662	Bluegill	Juvenile
	1,980,000	Walleye	Fry
	45,600	Yellow Perch	Fingerling
	7,026	Yellow Perch	Adult
1997	1,620	Black Crappie	Adult
	98,700	Bluegill	Fingerling
	1,974,000	Walleye	Fry
	4,024	Yellow Perch	Adult
1998	1,974,000	Walleye	Fry
1999	12,089	Black Crappie	Juvenile
	20,528	Yellow Perch	Juvenile
	8,225	Yellow Perch	Adult
2000	47,044	Yellow Perch	Juvenile
2001	8,992	Yellow Perch	Adult
2002	16,929	Yellow Perch	Juvenile
	700	Yellow Perch	Adult
2004	6,885	Yellow Perch	Fingerling
2005	385,950	Walleye	Fry
2006	104,910	Walleye	Sml. Fingerling
	3,582	Yellow Perch	Fingerling

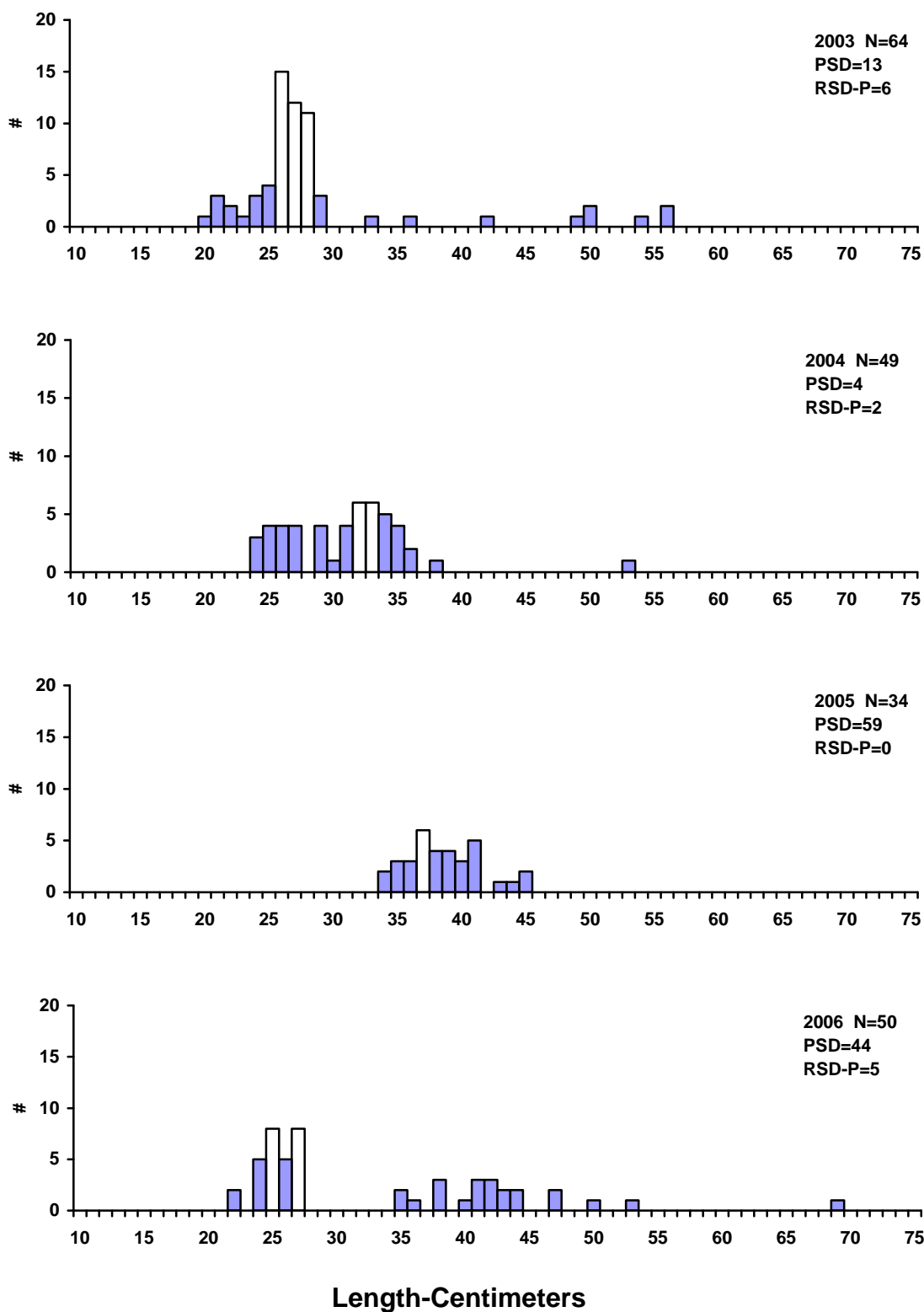


Figure 1. Length frequency histograms for walleyes sampled with gill nets in Brant Lake, Lake County, 2003-2006.

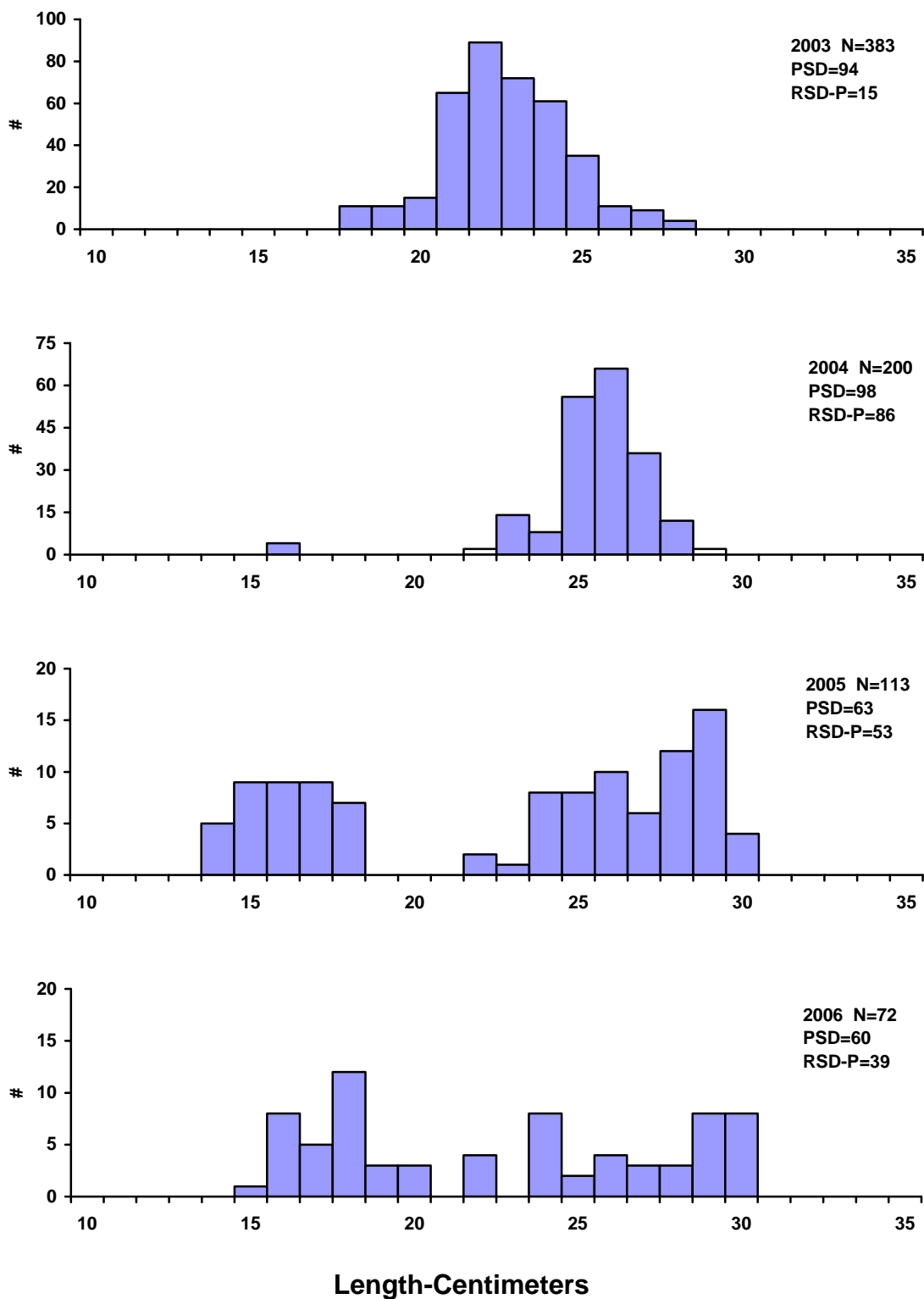


Figure 2. Length frequency histograms for yellow perch sampled in gill nets in Brant Lake, Lake County, 2003-2006.

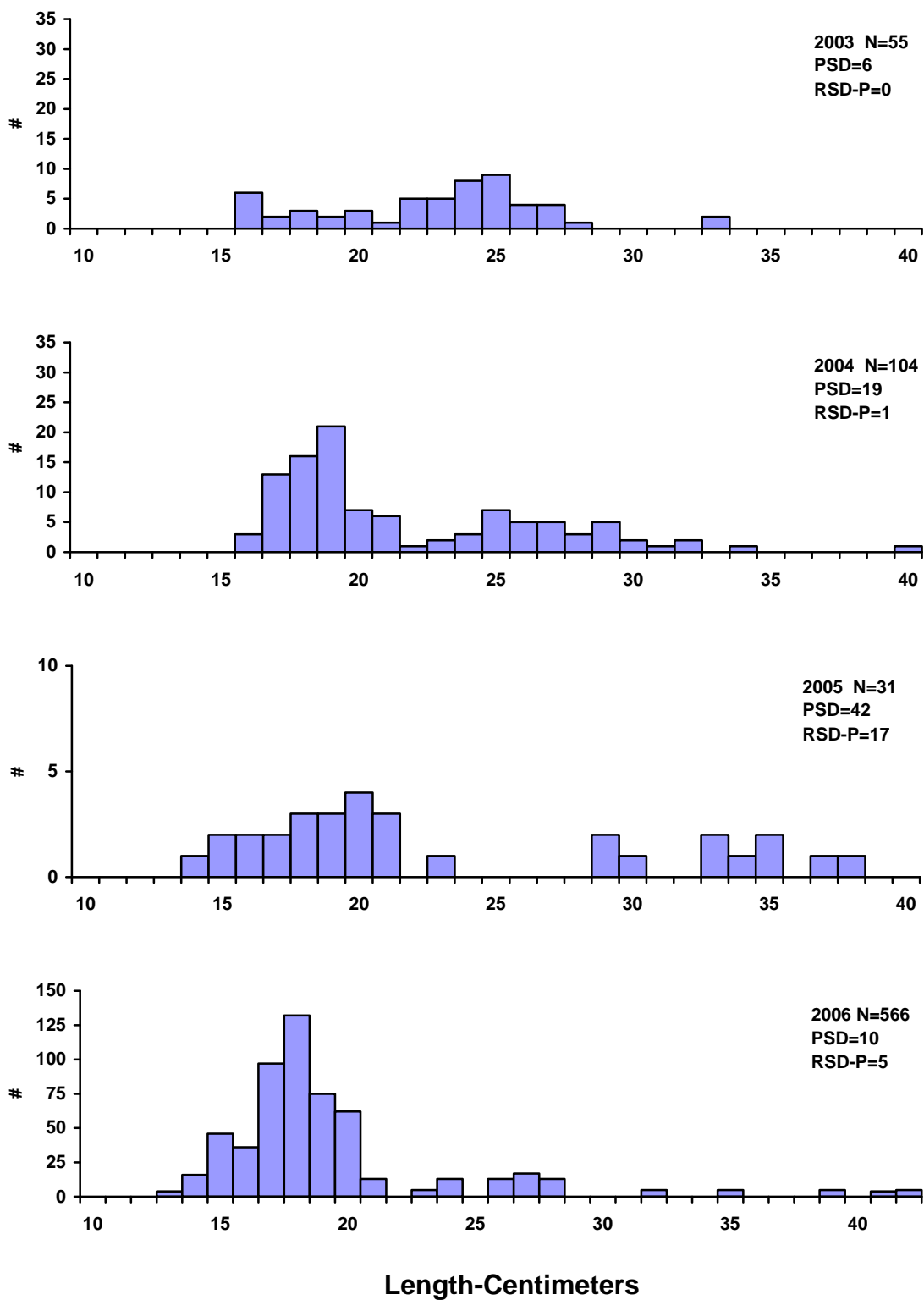


Figure 3. Length frequency histograms for smallmouth bass sampled with trap nets from Brant Lake, Lake County, 2003-2006.

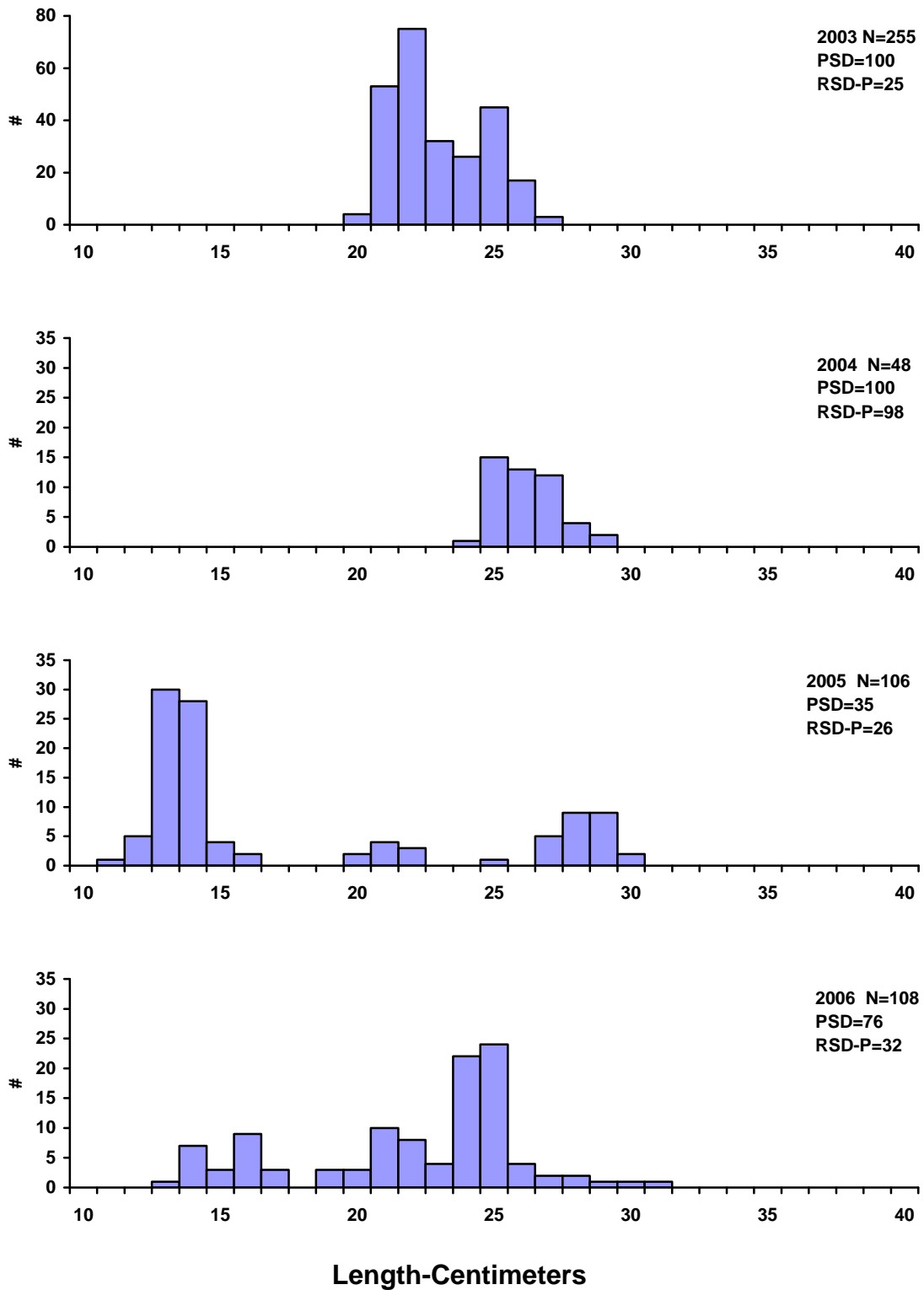


Figure 4. Length frequency histograms for black crappies sampled with trap nets in Brant Lake, Lake County, 2003-2006.

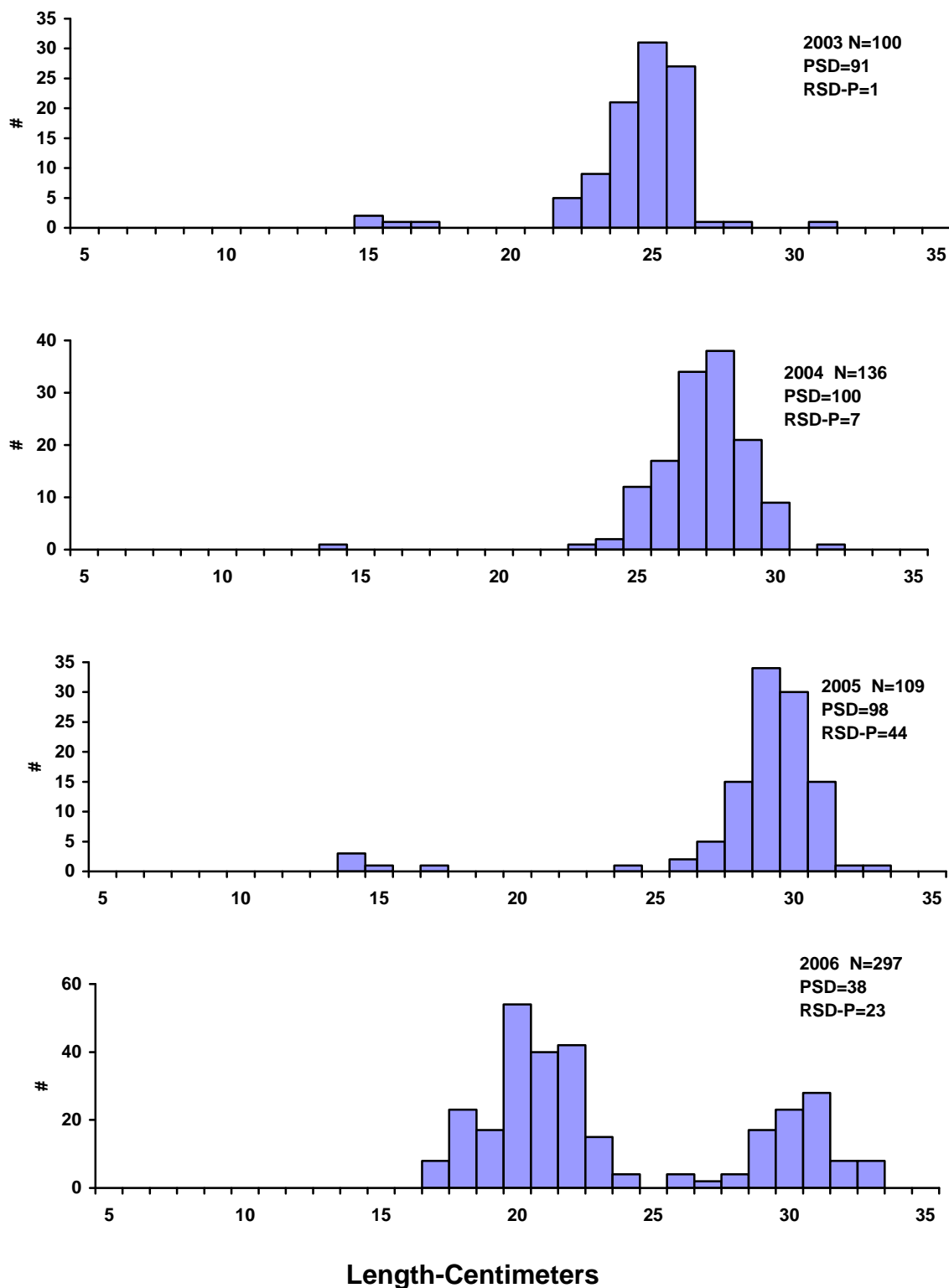


Figure 5. Length frequency histograms for black bullheads sampled with trap nets in Brant Lake, Lake County, 2003-2006.

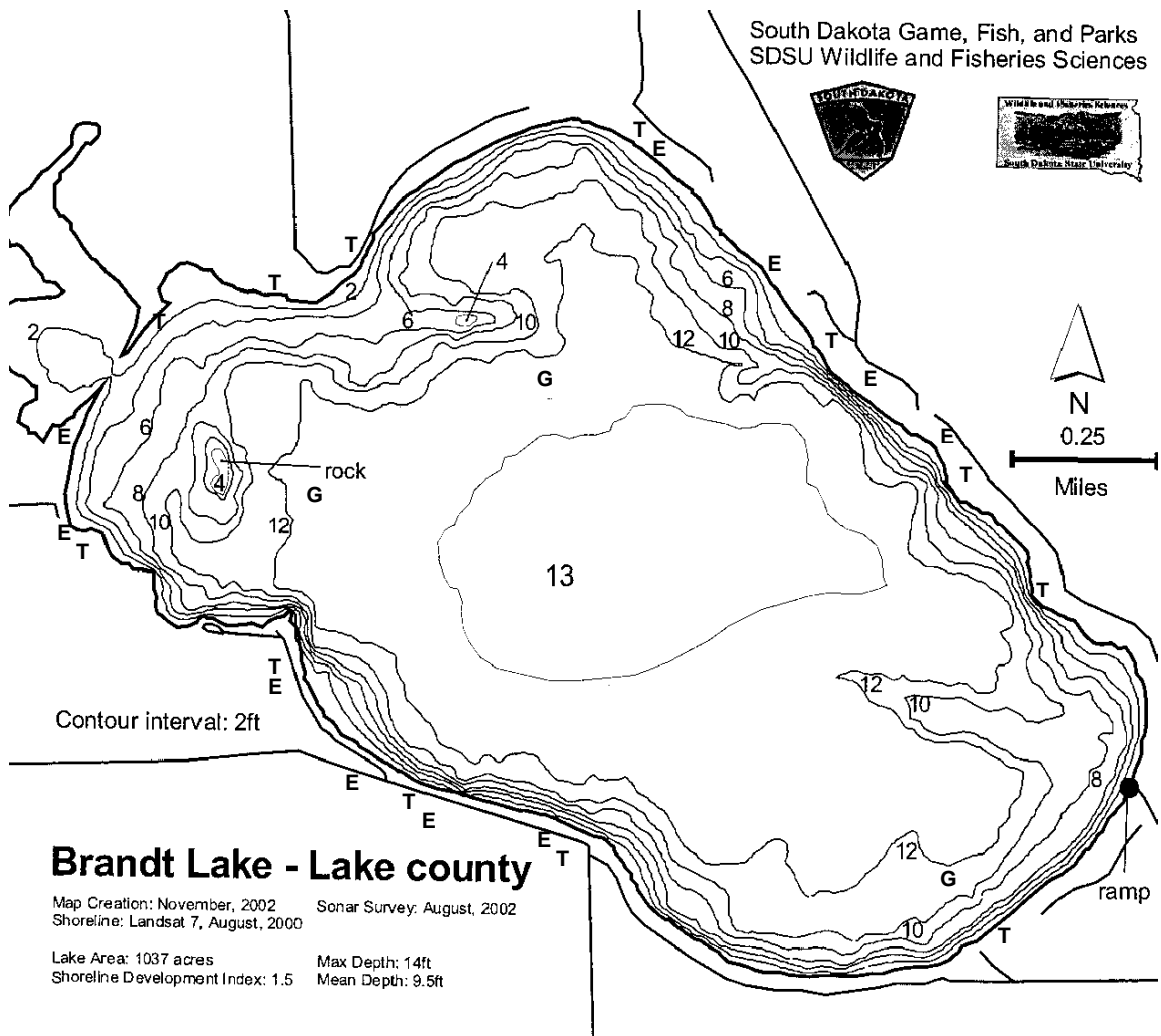


Figure 8. Sampling locations on Brant Lake, Lake County, 2006.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-39

Name: Lake Madison

County: Lake

Legal Description: T106-R51, 52-Sec. 21-23, 25-27, 29, 30-32

Location from nearest town: 5 miles southeast of Madison, SD

Dates of present survey: July 24-26, 2006 (netting); September 19, 2006 (electrofishing)

Dates of last survey: July 28-30, 2004 (netting); August 30, 2004 (electrofishing)

Primary Game and Forage Species	Secondary and Other Species
Walleye	Northern Pike
Yellow Perch	Black Crappie
	Bluegill
	Black Bullhead
	White Sucker
	Common Carp
	Bigmouth Buffalo
	Green Sunfish
	Hybrid Sunfish
	Channel Catfish
	Yellow Bullhead

PHYSICAL DATA

Surface area: 2,642 acres

Maximum depth: 16 feet

Volume: 27,153 acre-feet

Contour map available: Yes

OHWM elevation: 1603.7

Outlet elevation: 1603.2

Lake elevation observed during the survey: 2 feet low

Beneficial use classifications: (4) warmwater permanent fish life propagation, (7) immersion recreation, (8) limited-contact recreation and (9) fish and wildlife propagation and stock watering.

Watershed area: 29,191 acres

Mean depth: 8 feet

Shoreline length: 15.7 miles

Date mapped: 2002

Date set: November, 1980

Date set: November, 1980

Introduction

Lake Madison is a natural lake, second in a chain of four lakes (Herman, Madison, Round and Brant), formed by receding glacial ice. It was named for the 1875 town of Madison, originally located on the south shore of the lake. William Van Eps, the surveyor who platted the original town, named it Madison because he thought it resembled his hometown of Madison, Wisconsin.

Ownership of Lake and Adjacent Lakeshore Properties

Lake Madison is listed as meandered public water in the State of South Dakota Listing of Meandered Lakes and the South Dakota Department of Game, Fish, and Parks (GFP) manages the fishery. GFP also owns and manages access areas on the south, west and north shores of the lake. The remainder of the shoreline property is privately owned.

Fishing Access

The Payne Access Area on the west side of Lake Madison has a double lane boat ramp with a dock, public toilet and excellent shore fishing access. The Johnson Point Access Area on the north side of the lake has a double wide boat ramp with a dock, public toilet and excellent shore fishing access as well. The Stratton Access Area is located on the north shore of the lake and offers limited shore fishing opportunity. The Walker's Point Recreation Area on the south shore of the lake offers a double wide boat ramp with a dock, fish cleaning station, public toilets, and camping facilities with electric hookups. There is also a handicapped-accessible fishing dock as well as excellent shore fishing areas.

Field Observations of Water Quality and Aquatic Vegetation

The Secchi depth measurement in Lake Madison this year was 137 cm (54 in). Very little submerged or emergent vegetation was observed during the survey. A small amount of sago pondweed (*Potamogeton pectinatus*) was observed

BIOLOGICAL DATA

Methods:

Lake Madison was sampled on July 24-26, 2006 with four overnight gill-net sets and 10 overnight trap-net sets. The trap nets are constructed with 19-mm-bar-mesh ($\frac{3}{4}$ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh ($\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, and 2 in) monofilament netting. Two hours of nighttime electrofishing were done on September 19, 2006 to evaluate walleye recruitment. Sampling locations are displayed in Figure 5.

Results and Discussion:

Gill Net Catch

Yellow perch comprised 30.4% of the gill-net catch (Table 1). Walleye (24.8%), black bullhead (13.9%), white sucker (11.7%) and bigmouth buffalo (8.7%). Black crappie, common carp, and smallmouth bass were also sampled.

Table 1. Total catch from six overnight gill-net sets at Lake Madison, Lake County, July 24-26, 2006.

Species	Number	Percent	CPUE ¹	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Yellow Perch	70	30.4	17.5	± 12.0	121.4	49	19	104
Walleye	57	24.8	14.3	± 9.8	21.6	23	4	88
Black Bullhead	32	13.9	8.0	± 5.2	8.7	45	26	103
White Sucker	27	11.7	6.8	± 5.9	15.1	85	74	98
Bigmouth Buffalo	20	8.7	5.0	± 3.8	2.5	89	0	95
Black Crappie	10	4.3	2.5	± 1.5	0.8	33	11	122
Common Carp	8	3.5	2.0	± 1.3	2.9	--	--	--
Smallmouth Bass	6	2.6	1.5	± 1.2	0.0	--	--	--

* 10 years (1996-2005)

Trap Net Catch

Bigmouth buffalo (39.3%) and black crappie (17.0%) were the most abundant species sampled in the trap nets (Table 2). Nine other species were also sampled.

Table 2. Total catch from ten overnight trap net sets at Lake Madison, Lake County, July 24-26, 2006.

Species	Number	Percent	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Bigmouth Buffalo	205	39.3	20.5	± 10.2	5.8	84	4	91
Black Crappie	89	17.0	8.9	± 5.3	11.8	15	11	120
Common Carp	61	11.7	6.1	± 2.3	14.0	72	48	105
Bluegill	61	11.7	6.1	± 5.1	2.3	23	10	126
Black Bullhead	30	5.7	3.0	± 1.8	96.8	83	57	99
Walleye	21	4.0	2.1	± 1.6	6.0	0	0	88
Smallmouth Bass	21	4.0	2.1	± 3.7	0.0	5	5	110
White Sucker	15	2.9	1.5	± 0.7	19.5	100	100	88
Green Sunfish	10	1.9	1.0	± 0.6	0.8	20	0	111
Hybrid Sunfish	5	1.0	0.5	± 0.4	0.2	--	--	--
Yellow Perch	4	0.8	0.4	± 0.3	46.7	--	--	--

*10 years (1996-2005)

¹ See Appendix A for definitions of CPUE, PSD, and mean Wr.

Walleye

Management objective: Maintain a walleye population with a gill-net CPUE of at least 20, a PSD range of 30-60, and a growth rate of 14 inches by age-3.

Walleye gill-net CPUE increased slightly from 2005 (Table 3) but was still below our management objective. Small fish from the strong 2005 year-class dominated the catch (Figure 1) and reduced PSD. Growth was faster than statewide, regional and large lakes means (Table 4) and length at age-3 surpassed the management objective.

Natural reproduction was poor in 2006 (Table 5), however, the few fish produced were large and in excellent condition. Yearling CPH was weaker than expected given the moderately-strong year class produced in 2005.

Table 3. Walleye gill-net CPUE, PSD, RSD-P, and mean Wr for Lake Madison, Lake County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	24.7	34.3	36.7	12.2	24.7	16.2	9.0	8.0	10.7	14.3	20.9
PSD	7	10	3	5	27	71	85	67	6	23	30
RSD-P	0	0	0	0	0	4	56	25	2	4	9
Mean Wr	94	80	81	89	95	95	87	68	79	88	86

*10 years (1996-2005)

Table 4. Average back-calculated lengths (mm) for each age class of walleye in Lake Madison, Lake County, 2006.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2005	1	44	181							
2004	2	1	180	304						
2003	3	10	165	261	364					
2000	6	1	161	272	391	500	529	576		
1996	10	1	167	304	382	431	499	537	568	579
All Classes		57	171	285	379	466	514	557	568	579
Statewide Mean			168	279	360	425	490			
Region III Mean			173	281	367	435	517			
LLI* Mean			169	280	358	425	494			

*Large Lakes and Impoundments (>150 acres)

Table 5. Age-0 and age-1 walleyes sampled during 2 hours of nighttime electrofishing on Lake Madison, Lake County, 1999-2006.

Year	Stocking	Age-0 CPH	80% C.I.	% stocked	Mean length (range; mm)	Wr	Age-1 CPH	80% C.I.	Mean length (range; mm)	Wr
2006	none	4	1-7		199 (185-210)	109	10	6-14	309 (289-333)	101
2005	fingerling	128	82-174	100	158 (126-227)	90	0			
2004	none	2	0-4		163 (150-178)	102	30	21-39	244 (201-288)	80
2003	fingerling	293	186-400	100	154 (125-182)	87	2	1-3	312 (271-334)	86
2002	fry	12	7-17	90	209 (187-225)	110	4	0-8		
2001	none	4	1-6		222 (214-231)	106	0			
2000	none	15	6-24		190 (165-214)	98	58	31-85	267 (230-302)	83
1999	fry	166								

Yellow Perch

Management objective: Maintain a yellow perch population with a gill-net CPUE of at least 50 and a PSD range of 30-60.

Yellow perch gill-net CPUE decreased for the forth consecutive year and is well below our management objective (Table 6). Angler harvest, natural mortality and poor natural reproduction have contributed to the decline. Some recruitment has occurred, but no strong year classes have been produced since 2001. PSD and RSD-P values decreased as fish from the once dominant 2001 year-class leave the population (Tables 6-7 and Figure 2). Growth of older fish from the large 2001 year class was similar to statewide, regional and large lake means (Table 7), while growth of younger fish from smaller year classes exceeded those averages.

Table 6. Yellow perch gill-net CPUE, PSD, RSD-P, and mean Wr for Lake Madison, Lake County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	85.7	51.7	90.0	131.3	67.3	378.8	261.3	72.3	30.7	17.5	121.4
PSD	79	58	67	36	40	2	60	85	94	49	55
RSD-P	14	29	31	15	18	0	0	8	47	19	17
Mean Wr	116	103	102	106	108	87	95	98	96	104	103

*10 years (1996-2005)

Table 7. Average back-calculated lengths (mm) for each age class of yellow perch in Lake Madison, Lake County, 2006.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2005	1	34	105							
2004	2	10	82	188						
2003	3	7	93	180	220					
2001	5	17	102	163	199	231	251			
All Classes		68	96	177	209	231	251			
Statewide Mean			86	145	190	220	242			
Region III Mean			94	159	208	242	281			
LLI* Mean			86	146	192	225	249			

*Large Lakes and Impoundments (>150 acres)

Black Crappie

Management objective: Maintain a black crappie population with a trap net CPUE of at least 20 and a PSD of at least 40.

Black crappie trap-net CPUE and PSD declined below our management objectives in 2006 (Table 8). The crappies sampled averaged 172 mm (6.8 in), compared to 197 mm (7.8 in) in 2004 and 219 mm (8.6 in) in 2005 (Figure 3).

Crappie growth in Lake Madison is similar to regional, statewide and large lakes means (Table 9). Recruitment has become relatively consistent for a large lake population. Fish from the 2001-2005 year classes were sampled with the age-1 (2005 year class) fish being the most abundant. A large number of age-3 fish (2003 year class) were sampled in Brant Lake in 2006. Brant Lake data shows few black crappies were produced in 2003; however Lake Madison had a strong year class of black crappies in 2003. These fish probably moved downstream into Brant Lake. The CPUE in Lake Madison of the 2003 year class was 24.0 in 2005 and only 1.1 in 2006.

Table 8. Black crappie trap-net CPUE, PSD, RSD-P, and mean Wr for Lake Madison, Lake County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	3.5	0.4	0.5	2.3	1.6	10.0	18.7	47.5	31.5	8.9	11.8
PSD	100	--	--	43	21	11	32	61	92	15	52
RSD-P	57	--	--	17	14	5	6	5	7	11	15
Mean Wr	108	--	--	130	136	124	108	111	114	120	119

*10 years (1996-2005)

Table 9. Average back-calculated lengths (mm) for each age class of black crappie in Lake Madison, Lake County, 2006.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2005	1	75	96							
2004	2	3	69	116						
2003	3	11	98	181	236					
2002	4	2	100	195	226	242				
2001	5	1	84	189	206	236	268			
All Classes		92	95	172	232	240	268			
Statewide Mean			93	183	221	252	275			
Region III Mean			93	185	225	259	284			
LLI* Mean			90	192	241	272	299			

*Large Lakes and Impoundments (>150 acres)

All Species

Black bullhead numbers continue to decline from the high seen in 2002 (Table 10). The bigmouth buffalo trap-net catch was very high in 2006. Smallmouth bass had not been sampled before 2006 in Lake Madison. Trap net catches for other species remain consistent.

Table 10. Gill-net (GN) and trap-net (TN) CPUE for all fish species sampled in Lake Madison, Lake County, 1997-2006.

Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CCF (GN)	--	--	--	--	--	--	--	--	--	--
CCF (TN)	--	--	--	--	--	--	0.1	0.1	0.1	--
NOP (GN)	--	--	--	--	0.3	--	0.3	0.8	--	--
NOP (TN)	0.5	0.3	0.1	0.1	--	1.5	1.4	0.7	0.1	--
WAE (GN)	24.7	34.3	36.7	20.0	24.7	16.2	9.0	8.0	10.7	14.3
WAE (TN)	5.6	15.8	10.5	9.1	1.8	0.5	1.3	3.0	1.0	2.1
BLC (GN)	--	--	--	--	--	--	1.0	3.8	3.2	2.5
BLC (TN)	3.5	0.4	0.5	2.3	1.6	10.0	18.7	47.5	31.5	8.9
BLG (GN)	--	--	--	0.3	--	--	--	--	--	--
BLG (TN)	0.2	0.3	0.4	4.2	3.4	1.1	6.7	1.9	4.6	6.1
SMB (GN)	--	--	--	--	--	--	--	--	--	1.5
SMB (TN)	--	--	--	--	--	--	--	--	--	2.1
GSF (GN)	--	--	--	--	--	--	--	--	--	--
GSF (TN)	--	--	2.0	1.3	1.2	0.6	2.1	0.1	0.2	1.0
HYB (GN)	--	--	--	--	--	--	--	--	--	--
HYB (TN)	--	--	--	--	0.6	0.6	1.0	0.2	--	0.5
YEP (GN)	85.7	51.7	90.0	131.3	67.3	378.8	261.3	72.3	30.7	17.5
YEP (TN)	30.5	7.1	6.4	15.0	60.9	184.0	149.3	5.4	1.2	0.4
BLB (GN)	22.7	8.0	6.0	7.0	2.0	16.8	19.0	3.0	0.7	8.0
BLB (TN)	118.9	94.9	48.9	28.3	11.4	601.1	34.5	10.2	5.4	3.0
BIB (GN)	--	0.7	--	--	--	1.2	4.7	14.3	3.8	5.0
BIB (TN)	1.6	4.4	4.9	10.4	5.3	5.3	7.9	8.2	7.5	20.5
COC (GN)	0.3	0.3	1.3	1.7	1.0	16.8	2.0	1.5	1.7	2.0
COC (TN)	7.9	11.6	7.5	14.6	3.3	29.0	12.2	28.0	4.8	6.1
WHS (GN)	3.3	4.3	5.3	4.0	8.3	16.4	56.3	26.8	22.5	6.8
WHS (TN)	13.2	9.5	10.3	5.9	16.4	41.4	11.8	9.4	74.2	1.5
YBH (GN)	--	--	--	--	--	--	--	--	--	--
YBH (TN)	--	--	--	--	0.1	0.1	--	--	--	--

CCF (Channel Catfish), NOP (Northern Pike), WAE (Walleye), BLC (Black Crappie), BLG (Bluegill), SMB (Smallmouth Bass), GSF (Green Sunfish), HYB (Hybrid Sunfish), YEP (Yellow Perch), BLB (Black Bullhead), BIB (Bighorn Buffalo), COC (Common Carp), WHS (White Sucker), YBH (Yellow Bullhead)

Creel Survey Results

Winter 2005-06

Fishing pressure during winter 2005-06 decreased from the previous winter (Table 11). Winter fishing pressure has varied substantially from year to year (Table 11). Fishing pressure was highest in January followed by February. Anglers were primarily targeting walleyes (46%) and yellow perch (26%). The average length of a fishing trip was 3.0 hours and nearly all parties (95%) were South Dakota residents.

Winter fishing for walleyes, yellow perch and black crappies was slow (Tables 12). The best fishing was for black crappies in February with anglers targeting crappies harvesting 0.15 fish/h. Catch and harvest rates for all species were typically less than 0.05 fish/h.

Table 11. Estimates of fishing pressure and catch (harvest) of fish in Lake Madison from December through March, 2002-2006.

Year	Fishing Pressure (h)	Walleye Catch (Harvest)	Northern Pike Catch (Harvest)	Yellow Perch Catch (Harvest)	Black Crappie Catch (Harvest)
2005-06	8,307	626 (168)	6 (6)	65 (65)	338 (322)
2004-05	14,923	2,325 (433)	273 (233)	314 (294)	389 (307)
2003-04	4,614	275 (250)	0 (0)	2,414 (2,179)	0 (0)
2002-03	28,759	575 (100)	446 (321)	233,970 (78,335)	33 (33)

Table 12. Number of angler interviews and estimates of hourly catch rate (harvest rate) of fish in Lake Madison from December through March, 2002-2006.

Year	Number of Interviews	Walleye Catch (Harvest)	Northern Pike Catch (Harvest)	Yellow Perch Catch (Harvest)	Black Crappie Catch (Harvest)
2005-06	155	0.08 (0.02)	0.001 (0.001)	0.008 (0.008)	0.04 (0.04)
2004-05	328	0.16 (0.03)	0.02 (0.02)	0.02 (0.02)	0.03 (0.02)
2002-03	103	0.06 (0.05)	0 (0)	0.52 (0.47)	0 (0)
2003-04	426	0.02 (0.004)	0.02 (0.01)	8.14 (2.72)	0.001 (0.001)

Summer and Fall 2006

Summer fishing pressure in 2006 was down slightly from 2004 and 2005, but was still higher than in 1998-2002 (Table 13). Fishing pressure was highest in May when 63% of angling parties were targeting walleyes and 22% were targeting crappies. Relative to 2005, the percentage of anglers in 2006 targeting walleyes and black crappies increased while numbers targeting yellow perch decreased. Nearly 96% of angling parties were South Dakota residents.

Summer walleye catch decreased from 2005, however, anglers harvested a greater percentage of their catch (Table 11). Anglers enjoyed modest catch (0.15/h) and harvest (0.10/h) rates. Most (78%) of the walleyes harvested were longer than 35.6 cm (14 in, Figure 4).

Summer yellow perch catch and harvest rates declined sharply in 2006 (Table 14). Few yellow perch have been produced since 2001 to bolster the fishery. Black crappie catch and harvest were similar to 2005 with the best fishing having occurred in late-May.

Fall fishing pressure in 2006 was just over half that of 2005 (Table 15). Anglers primarily targeted yellow perch (39%), walleyes (19%) and black crappies (13%). About 90% of parties interviewed were South Dakota residents.

Yellow perch catch during fall 2006 was a fraction of the 2005 catch (Table 15). The yellow perch harvested ranged from 20-31 cm (8-12 in) in length. Black crappie catch and harvest were similar to fall 2005. Most of the harvested black crappies measured 25-30 cm (10-12 in) long.

Table 13. Estimates of fishing pressure and catch (harvest) of fish on Lake Madison from May through August, 1999-2006.

Year	Pressure (h)	Walleye Catch (Harvest)	Yellow Perch Catch (Harvest)	Black Crappie Catch (Harvest)	Bullheads Catch (Harvest)	Bluegill Catch (Harvest)
2006	21,792	3,227 (2,217)	574 (412)	4,933 (3,659)	424 (76)	0 (0)
2005	28,694	8,745 (1,495)	4,399 (3,831)	5,497 (4,797)	839 (0)	170 (100)
2004	36,903	10,101 (2,666)	10,286 (7,284)	15,328 (13,532)	4,998 (1,925)	335 (223)
2003	32,116	4,532 (3,027)	45,603 (28,334)	672 (650)	10,642 (2,151)	493 (54)
2002	14,632	696 (253)	29,417 (12,690)	94 (60)	5,766 (848)	148 (72)
2001	11,477	140 (426)	4,069 (3,265)	0 (0)	110 (325)	0 (0)
2000	18,660	11,098 (2,815)	801 (654)	0 (0)	4,628 (1,285)	0 (0)
1999	12,141	9,753 (507)	2,708 (1,865)	465 (0)	3,155 (2,439)	0 (0)
1998	18,374	7,307 (1,184)	4,735 (3,712)	0 (0)	3,561 (686)	0 (0)

Table 14. Number of interviews and estimates of catch and harvest rates (number/hour) on Lake Madison from May through August, 1999-2006.

Year	Number of Interviews	Walleye Catch (Harvest)	Yellow Perch Catch (Harvest)	Black Crappie Catch (Harvest)	Bullheads Catch (Harvest)	Bluegill Catch (Harvest)
2006	216	0.15 (0.10)	0.03 (0.02)	0.23 (0.17)	0.02 (0.04)	0 (0)
2005	314	0.30 (0.04)	0.15 (0.13)	0.19 (0.17)	0.03 (0)	0.006 (0.004)
2004	470	0.27 (0.07)	0.28 (0.20)	0.42 (0.37)	0.14 (0.05)	0.009 (0.006)
2003	276	0.14 (0.09)	1.42 (0.88)	0.02 (0.02)	0.33 (0.07)	0.02 (0.002)
2002	139	0.05 (0.02)	2.01 (0.87)	0.01 (0.01)	0.39 (0.06)	0.01 (0.005)
2001	82	0.05 (0.01)	0.65 (0.36)	0 (0)	0.04 (0.01)	0 (0)
2000	112	0.59 (0.15)	0.04 (0.04)	0 (0)	0.25 (0.07)	0 (0)
1999	152	0.80 (0.04)	0.22 (0.15)	0.04 (0)	0.26 (0.20)	0 (0)
1998	207	0.40 (0.06)	0.26 (0.20)	0 (0)	0.19 (0.04)	0 (0)5

Table 15. Estimates of fishing pressure and catch (harvest) of fish on Lake Madison from September through October, 2005-2006.

Year	Pressure (h)	Walleye Catch (Harvest)	Yellow Perch Catch (Harvest)	Black Crappie Catch (Harvest)	Bullheads Catch (Harvest)	Bluegill Catch (Harvest)
2006	11,041	413 (241)	1,866 (1,311)	3,964 (1,921)	273 (37)	142 (118)
2005	21,231	5,505 (937)	13,548 (11,458)	4,436 (3,868)	6 (0)	166 (82)

Table 16. Number of interviews and estimates of catch and harvest rates (number/hour) on Lake Madison from September through October, 2005-2006.

Year	Number of Interviews	Walleye Catch (Harvest)	Yellow Perch Catch (Harvest)	Black Crappie Catch (Harvest)	Bullheads Catch (Harvest)	Bluegill Catch (Harvest)
2006	140	0.04 (0.02)	0.17 (0.15)	0.36 (0.17)	0.02 (0.01)	0.01 (0.01)
2005	247	0.26 (0.04)	0.64 (0.54)	0.21 (0.18)	0.001 (0)	0.01 (0.01)

MANAGEMENT RECOMMENDATIONS

1. Monitor the Lake Madison fishery by conducting annual netting, electrofishing and creel surveys.
2. Continue efforts to achieve our perch management objective by enhancing spawning habitat and stocking. A South Dakota State University Ph.D project to better understand yellow perch population dynamics with a focus on mortality will run from 2005 through 2009.
3. Accomplish our walleye management objective by stocking OTC marked fry or fingerlings into voids of natural reproduction as determined by fall electrofishing results.
4. Continue efforts to develop a habitat management plan that incorporates artificial structures, fishing piers, rough fish management, and watershed management. Investigate the use of artificial structures to enhance spawning habitat and the use of barriers to protect panfish spawning areas from the destructive activities of common carp.
5. Encourage commercial fishing whenever rough fish abundance warrants it

Table 18. Stocking record for Lake Madison, Lake County, 1991-2006.

Year	Number	Species	Size
1991	4,200,000	Walleye	Fry
	150,000	Walleye	Sml. Fingerling
	60	Walleye	Adult
	75,341	Yellow Perch	Fingerling
1992	300,000	Walleye	Sml. Fingerling
	34	Walleye	Adult
	19,625	Yellow Perch	Fingerling
	283,766	Yellow Perch	Fingerling
1993	101,400	Fathead Minnow	Adult
1994	300,000	Walleye	Fry
	354,000	Walleye	Sml. Fingerling
	192,700	Fathead Minnow	Adult
	11	Walleye	Adult
1995	501	Walleye	Lrg. Fingerling
	42,537	Yellow Perch	Adult
	141,725	Yellow Perch	Fingerling
	189,400	Bluegill	Fingerling
1996	561,800	Walleye	Sml. Fingerling
	2,800,000	Walleye	Fry
	27,980	Yellow Perch	Adult
	2,600,000	Walleye	Fry
1999	28,000	Yellow Perch	Adult
	2,500,000	Walleye	Fry
2002	280,680	Walleye	Sml. Fingerling
2003	264,200	Walleye	Sml. Fingerling
2005			

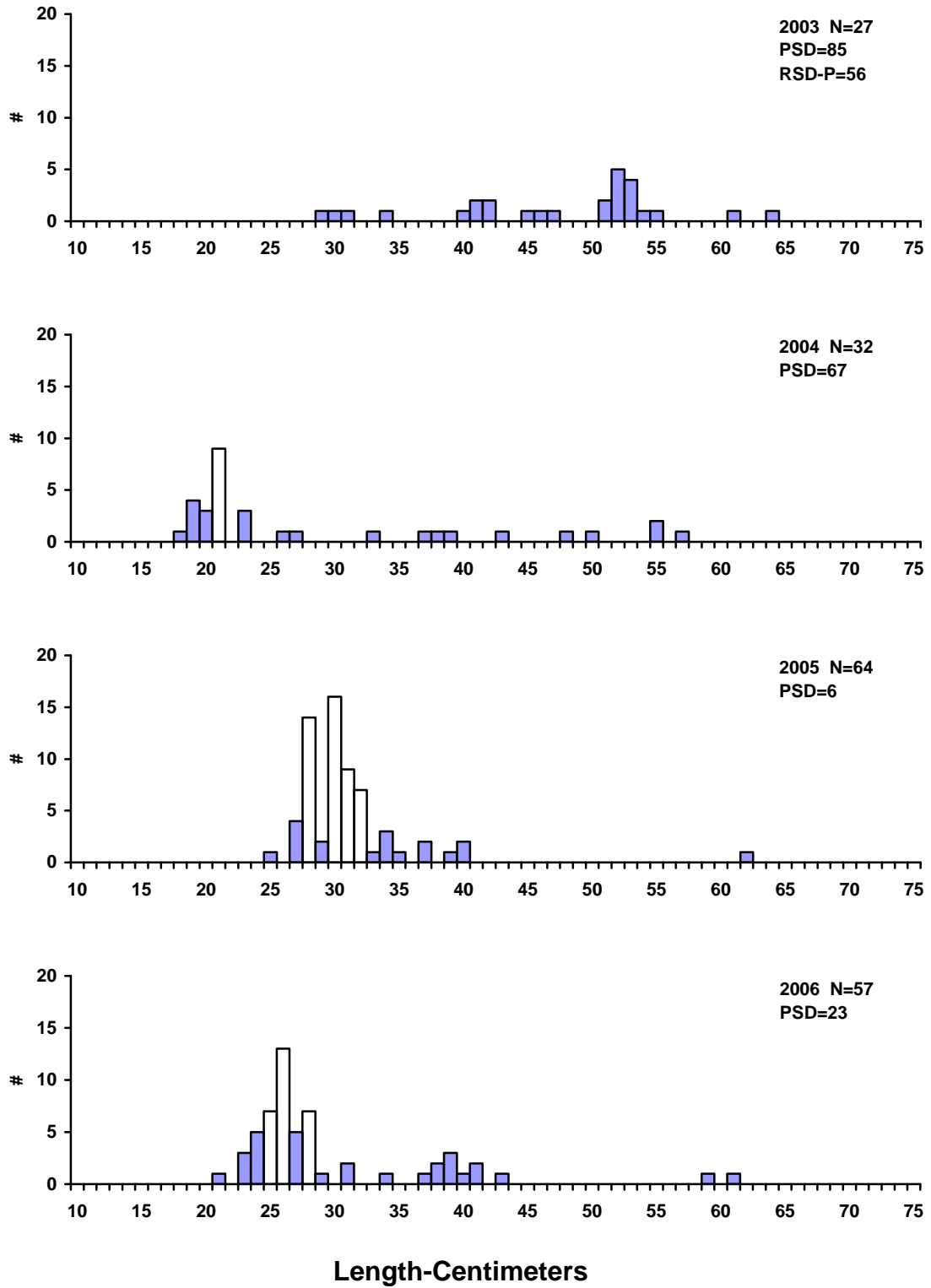


Figure 1. Length frequency histograms for walleye sampled with gill nets in Lake Madison, Lake County, 2003-2006.

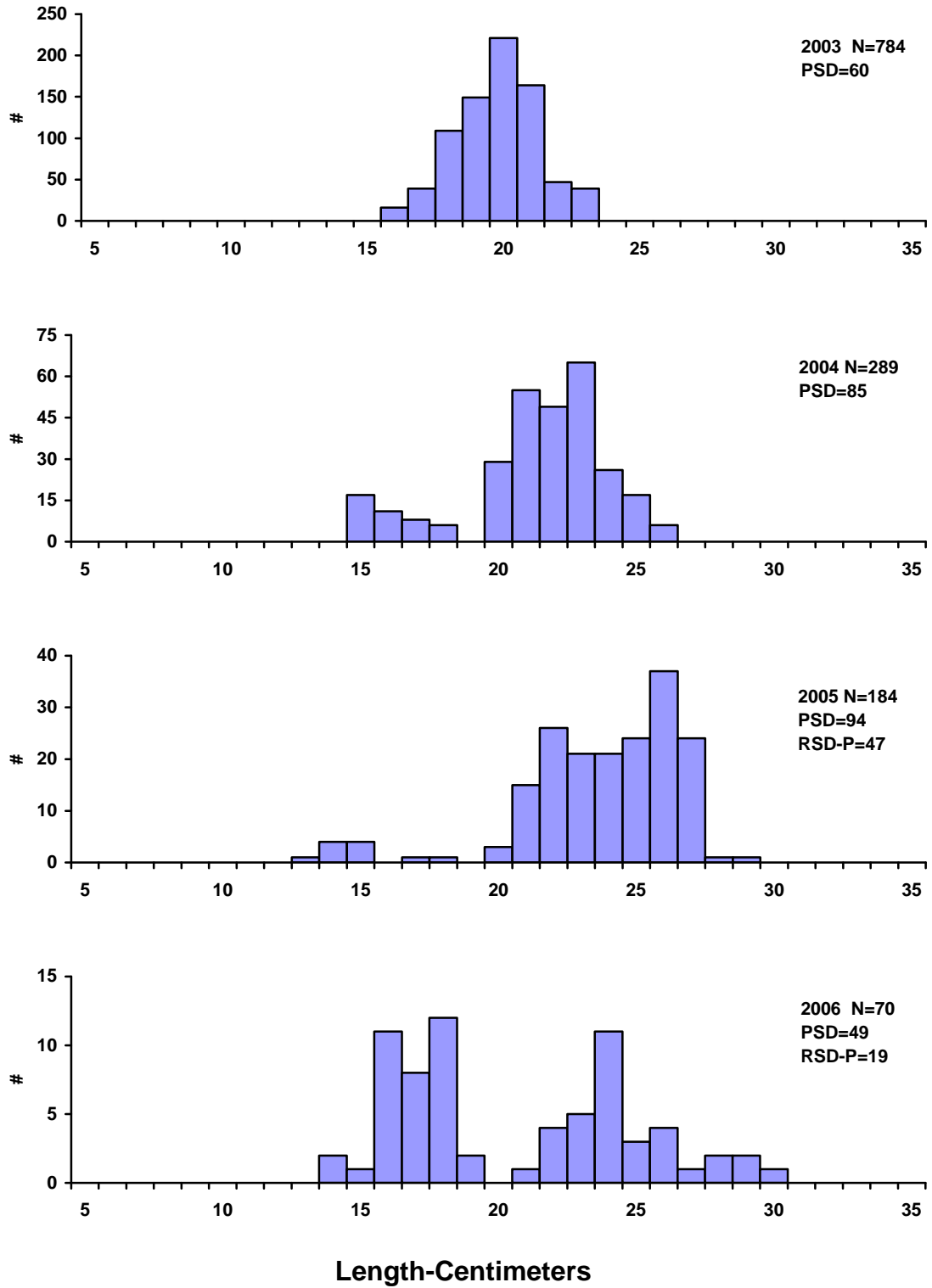


Figure 2. Length frequency histograms for yellow perch sampled with gill nets in Lake Madison, Lake County, 2003-2006.

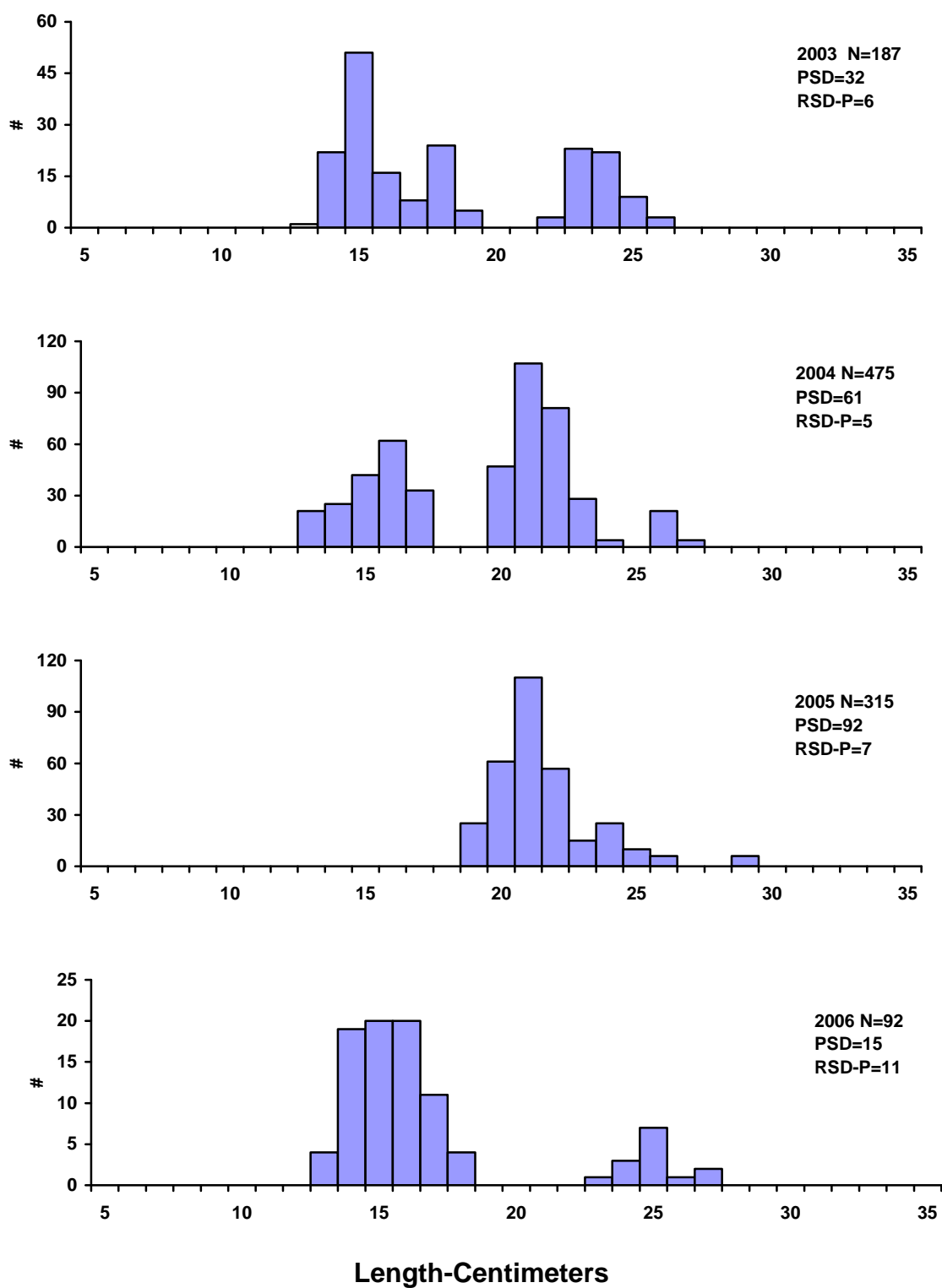


Figure 3. Length frequency histograms for black crappie sampled with trap nets in Lake Madison, Lake County, 2003-2006.

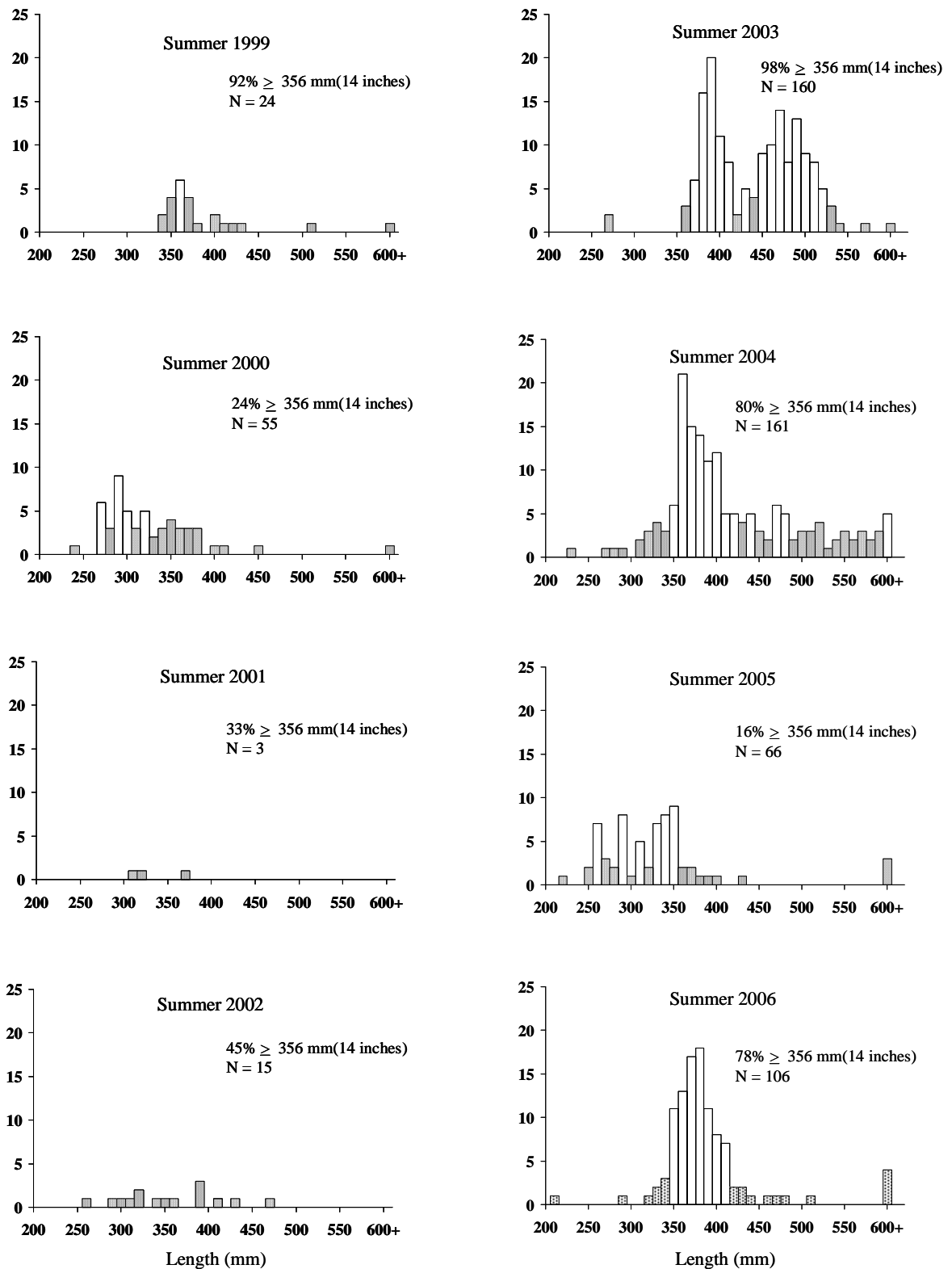


Figure 4. Length frequency of angler-harvested walleyes measured by the creel clerk during summer creel surveys on Lakemadison, 1999-2006.

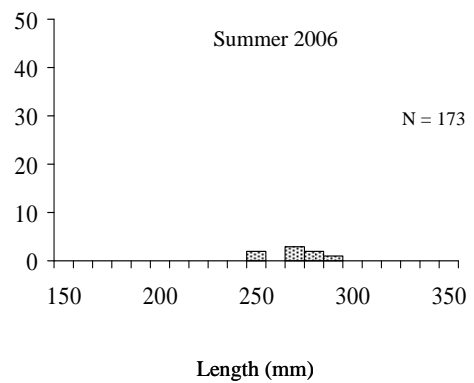
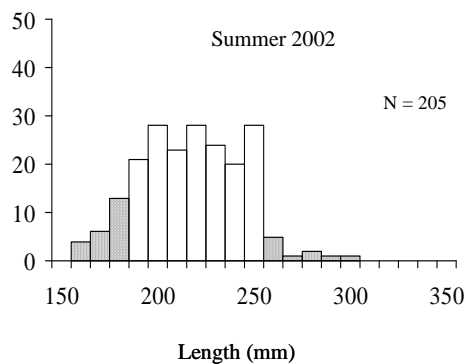
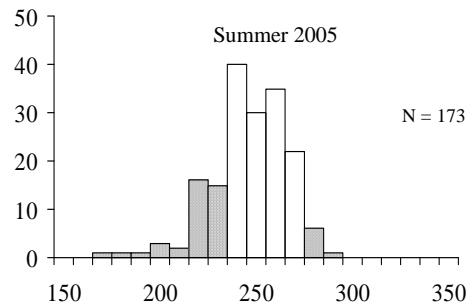
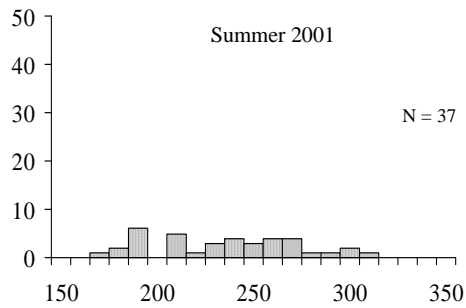
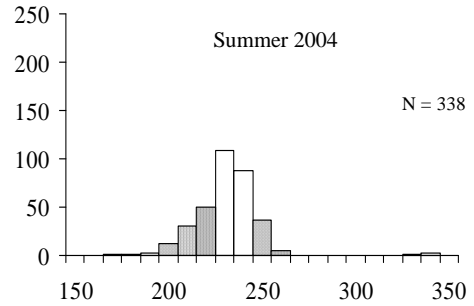
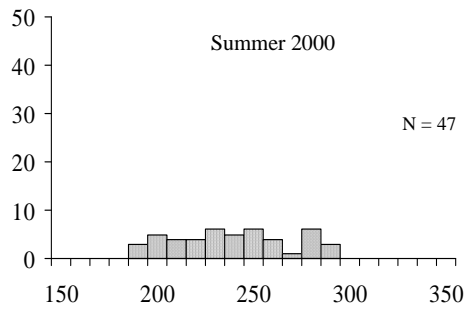
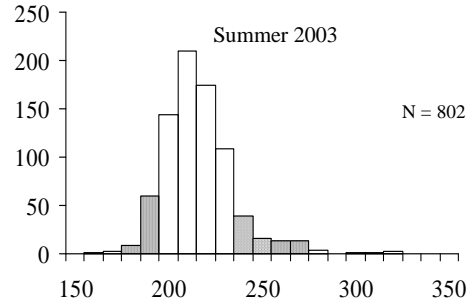
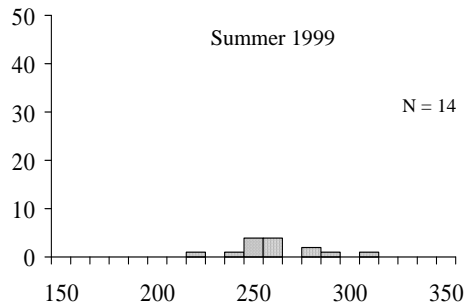
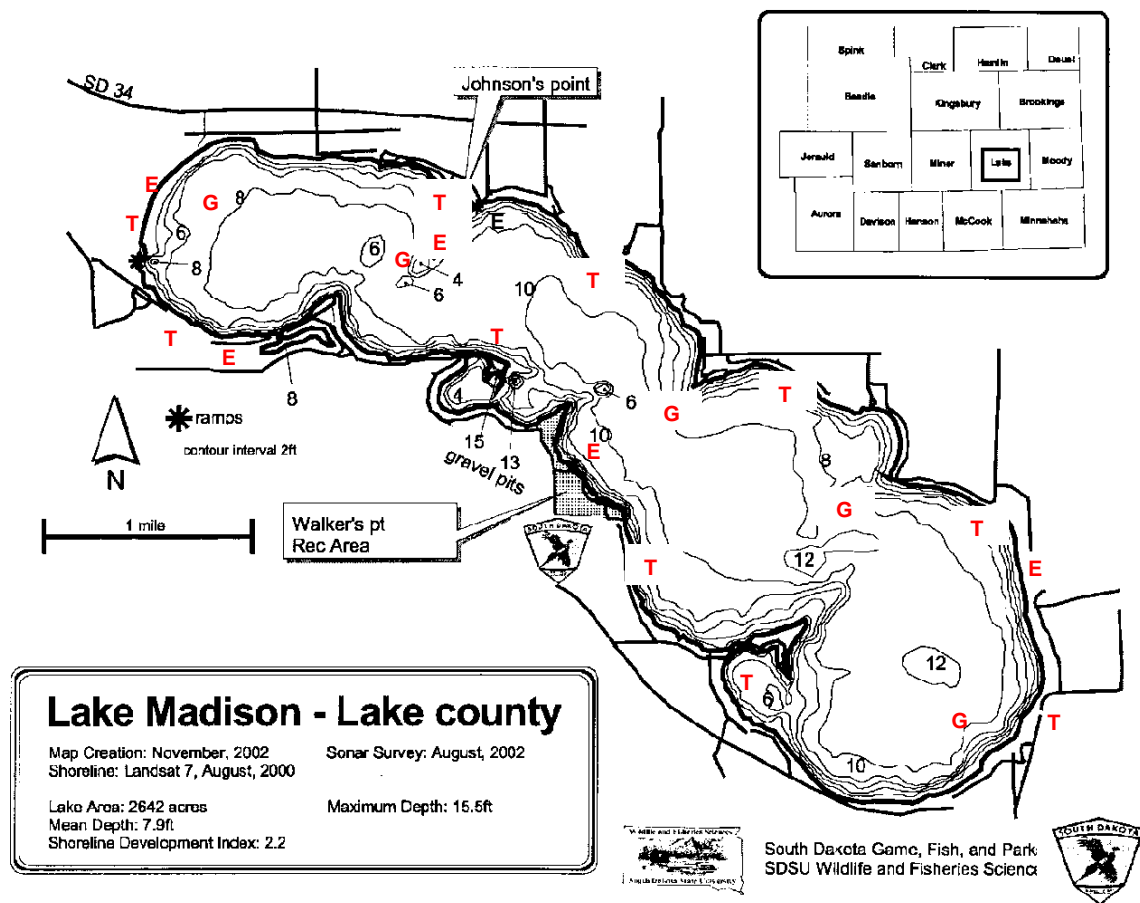


Figure 5. Length frequency of angler-harvested yellow perch measured by the creel clerk during summer creel surveys on Lake Madison, 1999-2006.



Legend Trap Net Sites: T
 Gill Net Sites: G
 Electrofishing Sites: E

Figure 5. Sampling locations on Lake Madison, Lake County, 2006.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-39

Name: Lake Alvin **County:** Lincoln
Legal Description: T100N- R49W-Sec. 33, 34
Location from nearest town: 3 miles east of Harrisburg, SD.

Dates of present survey: June 26-28, 2006
Dates of last survey: June 27-29, 2005 (netting); May 23, 2005 (electrofishing)

Primary Game and Forage Species	Other Species
Largemouth Bass	Yellow Perch
Black Crappie	Black Bullhead
White Crappie	Common Carp
Bluegill	White Sucker
Channel Catfish	Green Sunfish
	Northern Pike

PHYSICAL DATA

Surface area: 105 acres **Watershed area:** 24,564 acres
Maximum depth: 26 feet **Mean depth:** 9 feet
Volume: 930 acre feet **Shoreline length:** 4.3 miles
Contour map available: Yes **Date prepared:** 1997
Lake elevation observed during the survey: Full
Beneficial use classification: (4) warmwater permanent fish propagation, (7) immersion recreation, (8) limited-contact recreation and (9) fish and wildlife propagation and stock watering.

Introduction

Lake Alvin is an artificial impoundment formed by the construction of a dam across the lower end of Nine Mile Creek. The construction of the dam was completed in August 1954 and the lake completely filled in 1957. The concrete spillway for the dam was completely replaced in 1994.

Ownership of Lake and Adjacent Lakeshore Properties

Most of the land inundated by and surrounding Lake Alvin is owned and managed by the South Dakota Department of Game, Fish and Parks (GFP). The Parks Division of GFP manages a State Recreation Area surrounding the southeast, east, and northeast corners of the lake as well as a Lake Access Area on the northwest corner of the lake. The remainder of the shoreline is privately owned.

Fishing Access

The Lake Alvin Recreation Area has a single lane boat ramp with a dock, public toilet, and parking lot as well as several areas accessible to shore fishing. On the southeast corner of the dam there is a handicapped accessible fishing dock and several shorefishing areas. The Lake Access Area on the northwest corner of the lake has a public toilet and a narrow boat ramp with a dock suitable for small boats. There is plenty of shoreline to fish, however, the water is shallow in this area. The entire lake has been designated as a no-wake zone to protect the shoreline from erosion. At no time can boats exceed 5 mph or produce a visible wake.

Field Observations of Water Quality and Aquatic Vegetation

The Secchi depth measurement during the survey was 1.62 m (64 in) near the east end of the lake. It was much more turbid in the west end. Small beds of sago pondweed (*Potamogeton pectinatus*) and floating leaf pondweed (*Potamogeton natans*) were scattered along the south shore. Sparse stands of common cattail (*Typha spp.*) are found at the west end of the lake.

EXPERIMENTAL DRAWDOWN

Lake Alvin has a long history of poor fish growth due to poor water quality, lack of aquatic habitat and low invertebrate populations. In 2006, siphon tubes were used to lower the water level in an attempt to establish terrestrial and aquatic vegetation on the exposed lake bed and increase the overall productivity of the lake. Many terrestrial plant species, especially cottonwood trees, started growing from the naturally-occurring seed banks present in the exposed sediments. In addition, willow cuttings, cattails and various grasses were planted to supplement the naturally-occurring plants. However, a complete evaluation of the project was prohibited when storm runoff completely refilled the lake on two occasions.

BIOLOGICAL DATA

Methods:

Lake Alvin was sampled on June 26-28, 2006 with 10 overnight trap-net sets. The trap nets are constructed with 19-mm-bar-mesh ($\frac{3}{4}$ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. Sampling locations are displayed in Figure 4.

Results and Discussion:

Trap Net Catch

Black bullhead (73.4%), bluegill (14.1%), and black crappie (9.6%) were the most common species sampled in the trap nets (Table 1). Seven additional species were also sampled.

Table 1. Total catch from ten overnight trap net sets at Lake Alvin, Lincoln County, June 26-28, 2006.

Species	Number	Percent	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	2,477	73.4	247.7	±101.2	5.6	35	0	82
Bluegill	475	14.1	47.5	±19.8	78.6	51	0	92
Black Crappie	323	9.6	32.3	±17.3	36.8	34	7	110
Channel Catfish	58	1.7	5.8	±2.3	0.7	75	4	90
White Sucker	25	0.7	2.5	±0.4	7.1	100	100	81
White Crappie	8	0.2	0.8	±1.0	29.4	--	--	--
Green Sunfish	3	0.1	0.3	±0.4	0.0	--	--	--
Yellow Perch	2	0.1	0.2	±0.3	1.7	--	--	--
Hybrid Sunfish	1	0.0	0.1	±0.1	0.3	--	--	--
Largemouth Bass	1	0.0	0.1	±0.1	0.0	--	--	--

* 14 years (1992-2005)

Black/White Crappie

Management objective: Maintain a crappie fishery with a trap-net CPUE of at least 20 and PSD of at least 40.

Black crappie trap-net CPUE in 2006 was equal to 2005 (Table 2). Only once in the last ten years (2003) have we accomplished our management objectives for abundance and PSD. However, RSD-P is at the highest level in ten years indicating the presence of some larger fish. Young crappie growth is similar to statewide and small impoundments means (Table 3) but slows after age 3. Interestingly, back-calculated lengths-at-age are very similar for different year classes, indicating little variation in annual growth. The presence of fish from six consecutive year classes indicates consistent natural recruitment. Crappie condition (Mean Wr) in 2006 was higher than the 10-year mean (Table 2).

Table 2. Black crappie trap-net CPUE, PSD, RSD-P and mean Wr for Lake Alvin, Lincoln County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	12.6	40.7	65.5	61.6	63.9	68.0	28.8	19.7	32.3	32.3	42.8
PSD	73	7	19	21	14	25	49	29	10	34	26
RSD-P	1	0	0	0	0	0	0	0	0	7	0
Mean Wr	127	114	106	111	106	112	93	90	95	110	105

* 10 years (1996-2005)

Table 3. Average back-calculated lengths (mm) for each age class of black crappie in Lake Alvin, Lincoln County, 2006.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2005	1	226	93							
2004	2	27	81	172						
2003	3	14	87	156	204					
2002	4	32	98	148	181	210				
2001	5	16	104	172	194	214	241			
2000	6	8	97	140	181	209	224	261		
All Classes			93	158	190	211	232	261		
Statewide Mean			83	147	195	229	249			
Region III Mean			95	167	219	253	274			
SLI* Mean			78	134	180	209	226			

*Small Lakes and Impoundments (<150 acres)

Few white crappies have been sampled since the summer 2004 fish kill (Table 4). Four of eight fish sampled this year exceeded 25 cm (10 inches) in length.

Table 4. White crappie trap-net CPUE, PSD, RSD-P and mean relative weight (Wr) for Lake Alvin, Lincoln County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	40.2	27.0	44.3	35.5	17.1	13.1	74.8	0.9	0.1	0.8	29.6
PSD	80	13	17	25	15	17	49	67	--	--	35
RSD-P	1	1	1	2	3	2	0	0	--	--	1
Mean Wr	93	105	87	100	83	108	88	78	--	--	94

*10 years (1997-2006)

Bluegill

Management objective: Maintain a bluegill fishery with a trap-net CPUE of at least 20 and RSD-18 of at least 20.

Bluegill trap net CPUE decreased significantly from 2005 and was well below the 10-year mean (Table 5). The 2004 year class was most abundant, but many fish from the large 2001 and 2002 year classes were also present (Table 6). Growth after age-3 is slower than the statewide, regional and small impoundment means (Table 6).

In the last ten years, our management objective was only achieved in 1997-1998 when bluegill abundance was much lower than it is now. This fact, combined with the growth information above, suggests that bluegill growth in Lake Alvin is density dependent.

Table 5. Bluegill trap-net CPUE, PSD, RSD-P and mean Wr for Lake Alvin, Lincoln County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	20.6	24.7	11.7	26.5	48.3	115.3	229.3	172.1	186.5	47.5	91.9
PSD	81	57	26	34	26	11	26	47	60	51	46
RSD-P	11	7	3	0	0	0	0	0	0	0	2
RSD-18	58	29	5	2	1	0	1	5	0	5	14
Mean Wr	104	107	96	105	86	119	94	88	95	92	99

*10 years (1996-2005)

Table 6. Average back-calculated lengths (mm) for each age class of bluegills in Lake Alvin, Lincoln County, 2006.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2005	1	50	98							
2004	2	204	54	120						
2003	3	43	56	107	156					
2002	4	77	54	114	138	160				
2001	5	91	53	110	138	151	167			
2000	6	10	52	119	143	155	165	179		
All Classes		475	61	114	144	155	166	179		
Statewide Mean			55	103	141	166				
Region III Mean			60	116	157	180				
SLI* Mean			53	101	138	163				

*Small Lakes and Impoundments (<150 acres)

All Fish Species

Black bullhead CPUE has greatly increased since 2005 and is at its highest level in 10 years. Channel catfish CPUE has also increased since the stocking of 358 and 460 adults in 2004 and 2005, respectively. The abundance of most other species has remained relatively constant over the last 10 years.

Table 7. Trap-net (TN) CPUE for all fish species sampled in Lake Alvin, Lincoln County, 1997-2006.

Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CCF	0.1	0.8	0.2	0.6	1.1	2.7	0.9	1.8	0.9	5.8
NOP	--	--	--	0.1	0.2	0.3	0.1	--	0.1	--
WAE	0.3	--	--	0.1	0.1	--	--	--	--	--
BLC	12.6	40.7	65.5	61.6	63.9	68.0	28.8	19.7	32.3	32.3
BLG	20.6	24.7	11.7	26.5	48.3	115.3	229.3	172.1	186.5	47.5
GSF	0.3	0.1	--	--	0.1	--	0.2	0.2	0.2	0.3
HYB	--	--	0.1	--	--	--	3.8	--	--	0.1
OSF	--	0.3	0.9	0.8	6.9	2.8	1.4	0.9	--	--
WHC	40.2	27.0	44.3	35.5	17.1	13.1	74.8	0.9	0.1	0.8
YEP	--	5.1	1.4	1.9	5.0	3.4	2.9	1.7	0.4	0.2
BLB	4.6	1.9	0.6	3.2	0.1	2.1	8.5	16.5	12.1	247.7
COC	1.6	0.9	0.5	0.2	0.1	0.2	0.1	0.1	0.5	--
GOS	--	0.1	--	--	0.1	--	--	--	0.1	--
SMB	--	--	--	--	--	0.2	--	--	--	--
LMB	--	--	--	--	--	--	--	--	--	0.1
WHS	3.0	6.1	3.2	9.5	9.4	4.8	2.5	4.3	3.8	2.5

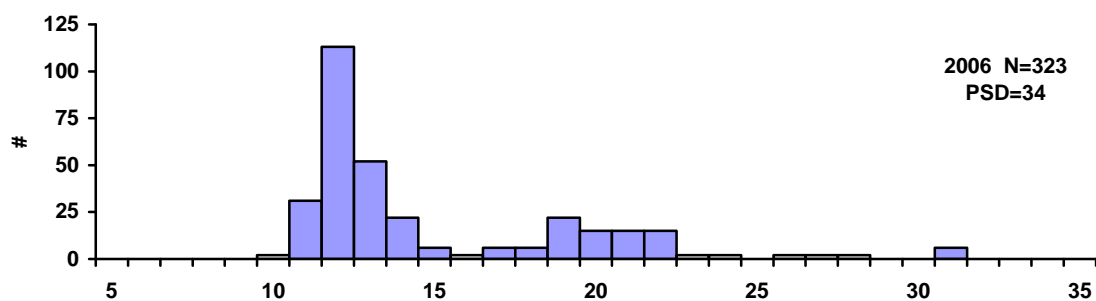
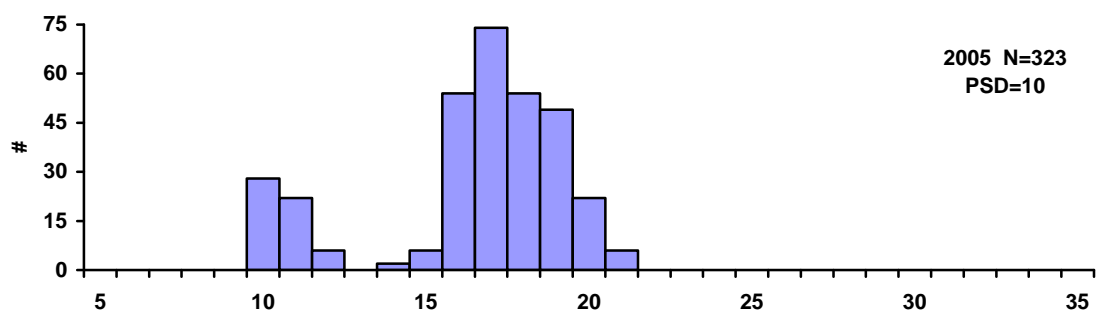
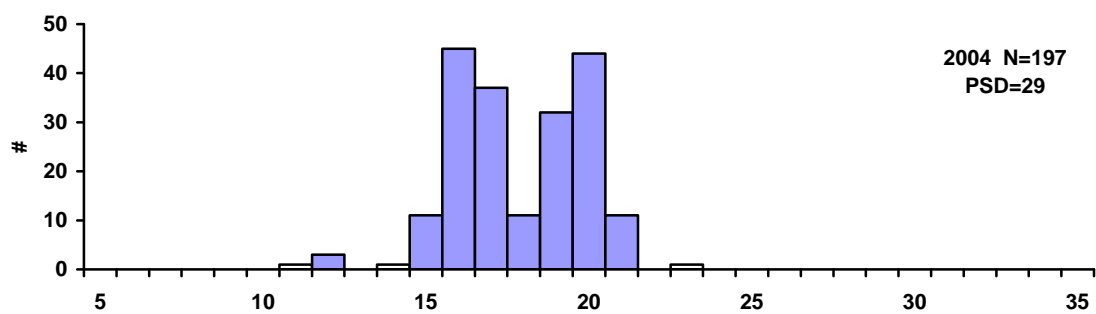
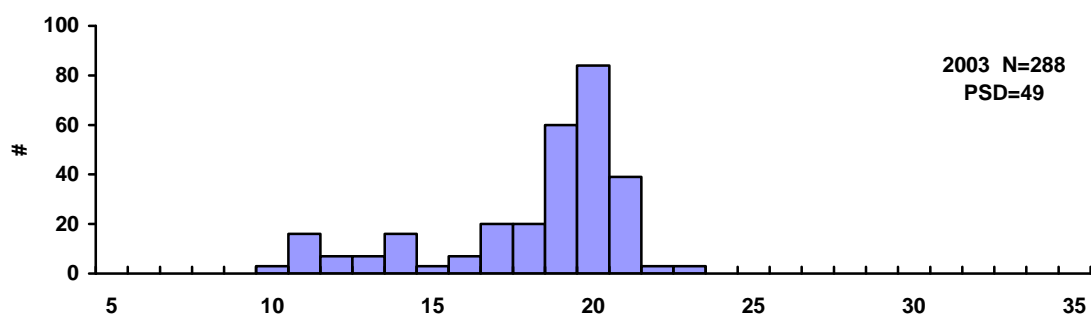
CCF (Channel Catfish), LMB (Largemouth Bass), NOP (Northern Pike), WAE (Walleye), BLC (Black Crappie), BLG (Bluegill), GSF (Green Sunfish), HYB (Hybrid Sunfish), OSF (Orange-spotted Sunfish), WHC (White Crappie), YEP (Yellow Perch), BLB (Black Bullhead), COC (Common Carp), GOS (Golden Shiner), SMB (Smallmouth Bass), WHS (White Sucker)

MANAGEMENT RECOMMENDATIONS

1. Consider repeating the drawdown experiment in 2007. While the results of the 2006 effort were encouraging, they were inconclusive due to the two flood events.
2. If the drawdown project is not repeated in 2007, consider a fish removal project to reduce panfish and nuisance fish densities. Long-term trend data indicates that bluegills and crappies grow faster and get larger when populations are lower.
3. Begin the initial planning needed to construct a sedimentation dam on the Game Production Area (GPA) above the lake. This dam would trap sediments and other pollutants before they enter the lake, resulting in better water quality and hopefully, an increase in the amount of aquatic habitat.
4. Continue to artificially enhance the habitat in Lake Alvin by aquatic plant transplants and the placement of inshore and offshore structures.

Table 8. Stocking record for Lake Alvin, Lincoln County, 1991-2006.

Year	Number	Species	Size
1991	525,000	Fathead Minnow	Adult
	3,000	Walleye	Lrg. Fingerling
1992	30,000	Black Crappie	Fingerling
	12,000	Channel Catfish	Fingerling
	3,212	Walleye	Lrg. Fingerling
	29,500	Yellow Perch	Fingerling
1993	3,355	Walleye	Lrg. Fingerling
1994	9,036	Black Crappie	Lrg. Fingerling
1996	1,203	Black Crappie	Adult
1997	9,000	Largemouth Bass	Fingerling
2002	195	Largemouth Bass	Adult
2003	201	Largemouth Bass	Adult
2004	358	Channel Catfish	Adult
	220	Largemouth Bass	Adult
2005	460	Channel Catfish	Adult



Length (cm)

Figure 1. Length-frequency histograms for black crappies sampled with trap nets in Lake Alvin, Lincoln County, 2003-2006. Length frequency of the total catch was extrapolated from a sample of 100 measured fish.

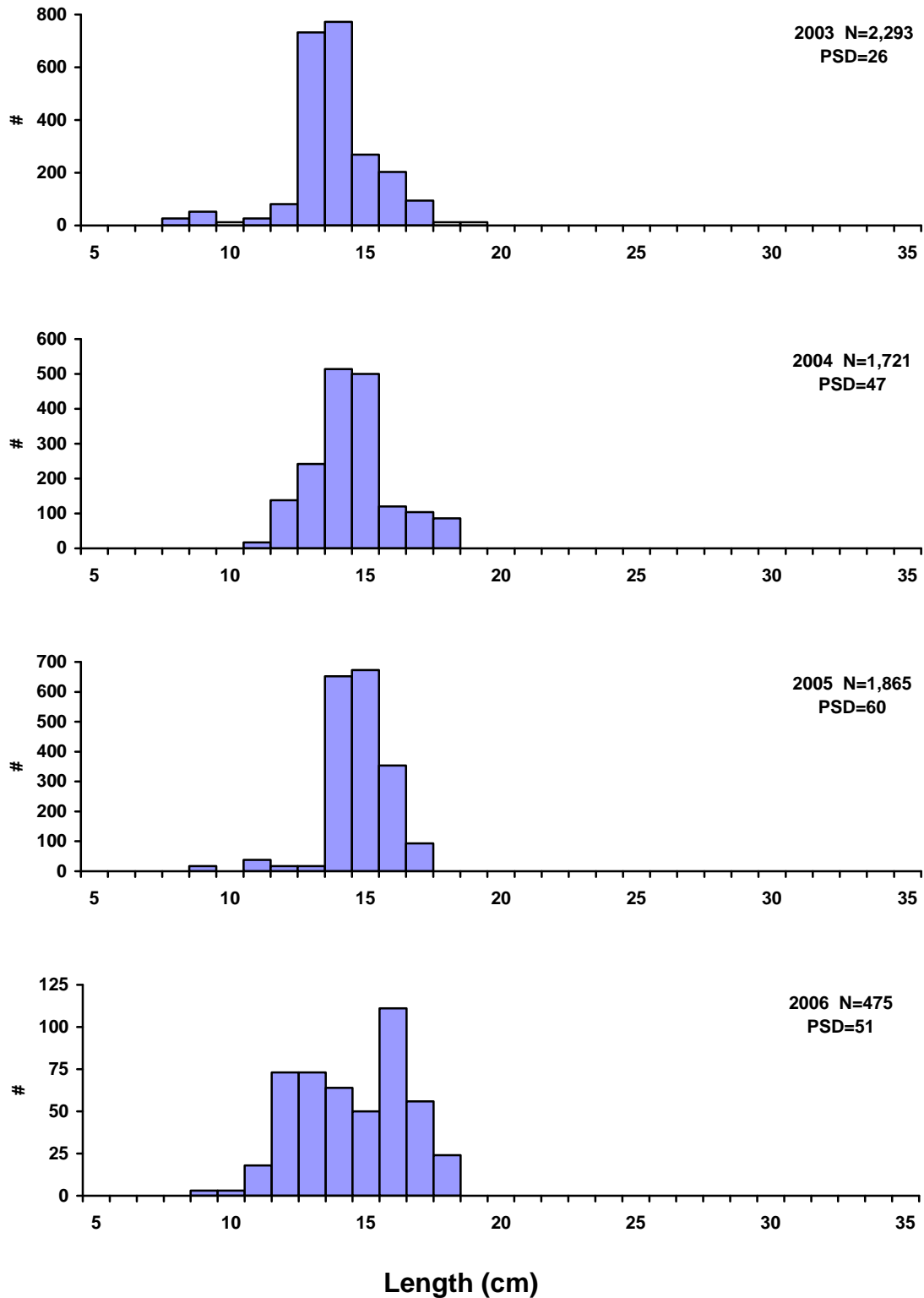


Figure 2.Length-frequency histograms for bluegill sampled with trap nets in Lake Alvin, Lincoln County, 2003-2006. Length frequency of the total catch was extrapolated from a sample of 100 measured fish.

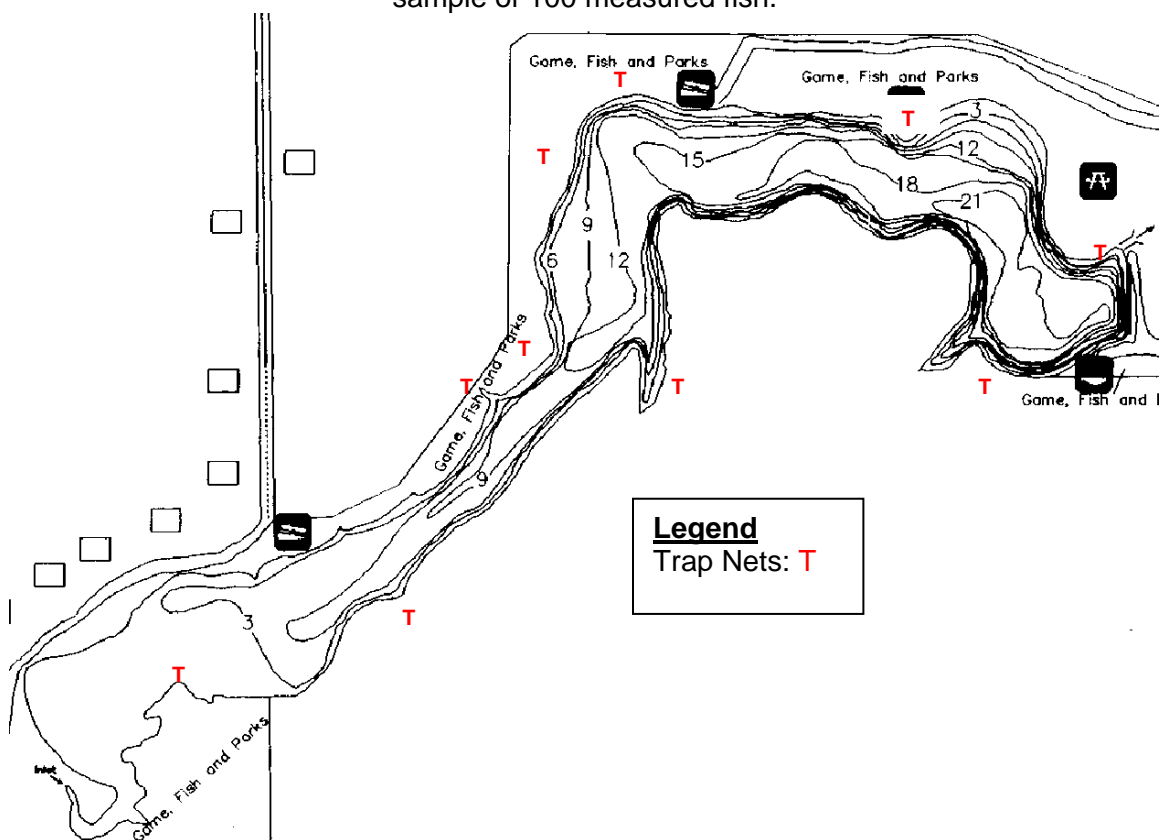


Figure 3. Sampling locations on Lake Alvin, Lincoln County, 2006.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-39

Name: Lake Lakota

County: Lincoln

Legal Description: T97N-R48W-Sec. 19

Location from nearest town: 1 mile south, 3-1/2 miles west of Fairview, SD

Dates of present survey: May 31, 2006 (all species electrofishing)

Date last surveyed: June 2, 2004 (all species electrofishing)

Primary Game Species	Other Species
Largemouth Bass	Black Crappie
Bluegill	Black Bullhead
Yellow Perch	White Crappie

PHYSICAL DATA

Surface Area: 100 acres

Watershed area: 25,462 acres

Maximum depth: 25 feet

Mean depth: 12 feet

Volume: No data

Shoreline length: No data

Contour map available: Yes

Date mapped: Unknown

OHWM elevation: None set

Date set: NA

Outlet elevation: None set

Date set: NA

Lake elevation observed during the survey: Full

Beneficial use classifications: (4) warmwater permanent fish propagation, (7) immersion recreation, (8) limited-contact recreation and (9) fish and wildlife propagation and stock watering.

Introduction

Lake Lakota was originally named Pattee Creek Watershed Structure P-1 because of it's location in the Pattee Creek Watershed Project. The lake provides excellent fishing when full but a leak in the basin frequently causes the lake to go dry.

Ownership of Lake and Adjacent Lakeshore Properties

Lake Lakota and the surrounding land are owned and managed by the South Dakota Department of Game, Fish and Parks. Land management is split between the Parks and the Wildlife Divisions.

Field Observations of Water Quality and Aquatic Vegetation

Sago pondweed (*Potamogeton pectinatus*) and coontail (*Ceratophyllum demersum*) covered approximately 75 percent of the surface area of the lake this year. The water was very clear with a Secchi depth measurement of 2 m (79 in) and no floating algae was observed.

BIOLOGICAL DATA

Methods:

The fish population was sampled by nighttime electrofishing for 1.7 hours on May 31, 2006. Electrofishing is used because dense stands of submergent vegetation make sampling with frame nets ineffective. Electrofishing results are listed in Table 1, length frequencies in Figure 1 and sampling locations in Figure 2.

Results and Discussion:

Electrofishing Catch

Largemouth bass was the most abundant species (69.6%) sampled followed by bluegill, black bullhead, yellow perch, white crappie, and black crappie (Table 1).

Table 1. Total catch of 1.67 hours of electrofishing at Lake Lakota, Lincoln County, May 31, 2006.

Species	Number	Percent	CPUE	80% C. I.	PSD	RSD-P	Mean Wr
Largemouth Bass	147	41.1	88.2	<u>+4.8</u>	78	28	104
Bluegill	118	33.0	70.8	<u>+8.5</u>	81	6	129
Black Bullhead	69	19.3	38.4	<u>+3.4</u>	97	81	96
Yellow Perch	14	3.9	8.4	<u>+0.5</u>	57	0	101
White Crappie	6	1.7	3.6	<u>+1.0</u>	--	--	--
Black Crappie	4	1.1	2.4	<u>+1.0</u>	--	--	--

Largemouth Bass

Management objective: Maintain a largemouth bass fishery with an electrofishing CPUE of at least 20.

Largemouth bass electrofishing CPUE was 88.2 with a PSD of 78 (Table 1) indicating a high-density population. Twenty-one bass longer than 38 cm (15 in) were sampled. Growth rates were below average for South Dakota waters (Table 2). Table 2 and the length frequency histogram in Figure 1 shows multiple year classes of bass are present in the population with the 2004 year class dominating the catch. They likely originated from the stocking of 9,500 fingerlings after the lake refilled in 2004 (Table 5). Naturally-reproduced bass from the 2002 year class were also abundant.

Table 2. Average back-calculated lengths, in mm, for each age class of largemouth bass from Lake Lakota, Lincoln County, May 31, 2006.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2005	1	1	101							
2004	2	66	76	177						
2003	3	12	119	199	295					
2002	4	38	105	191	265	349				
2001	5	15	97	195	296	352	398			
2000	6	9	89	187	255	322	369	401		
1998	8	2	88	129	207	280	347	391	437	467
All Classes		143	97	180	264	326	371	396	437	467
Statewide Mean			96	182	250	305	342			
Region III Mean			111	212	287	347	383			
SLI* Mean			99	183	246	299	332			

*Small Lakes and Impoundments (<150 acres)

Bluegill

Management objective: Maintain a bluegill fishery with an electrofishing CPUE of at least 50 and RSD-18 of at least 20.

Lake Lakota contains a good bluegill population with a CPUE of 70.8 and RSD-18 of 71 (Table 1). The sampled fish ranged in length from 78-231 mm (3.1-9.1 in) and their growth is similar to the regional mean and faster than statewide and small impoundments means (Table 3). Bluegills from 1 to 7 years old were present in the sample indicating consistent natural reproduction.

Table 3. Average back-calculated lengths (mm) for each age class of bluegills in Lake Lakota, Lincoln County, 2006.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2005	1	1	51							
2004	2	16	41	114						
2003	3	11	44	129	144					
2002	4	52	42	108	158	180				
2001	5	33	48	138	155	182	189			
2000	6	3	53	88	166	181	200	212		
1999	7	1	62	108	165	178	185	199	208	
All Classes		117	49	114	158	180	192	206	208	
Statewide Mean			55	103	141	166				
Region III Mean			60	116	157	180				
SLI* Mean			53	101	138	163				

*Small Lakes and Impoundments (<150 acres)

Black Bullhead

Management objective: Maintain a black bullhead population with an electrofishing CPUE of less than 100.

The black bullhead population in Lake Lakota consists of relatively low numbers (CPUE = 38.4) of large fish (RSD-P = 81). The high-density bass population probably keeps bullhead recruitment low, which allows the surviving fish to grow fast.

All Species

One predator species and five panfish species were present in the electrofishing catch. When water levels are sufficient, Lake Lakota offers some excellent angling opportunity for this heavily populated area of the state.

Table 4. Electrofishing CPUE for all fish species sampled in Lake Lakota, Lincoln County, 1997-2006.

Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
LMB			5.3					312.6		88.2
BLG			29.5					5.4		70.8
BLC			--					49.8		2.4
WHC			--					2.4		3.6
BLB			47.3					51.0		38.4
YEP			38.7					28.2		8.4
CCF			6.7					--		--
WAE			6.0					--		--

MANAGEMENT RECOMMENDATIONS

1. Continue to monitor Lakota with an all-species electrofishing survey every other year.

Table 4. Stocking record for Lake Lakota, Lincoln County, 1996-2006.

Year	Number	Species	Size
1996	1,716	Yellow Perch	Adult
2001	10,000	Largemouth Bass	Fingerling
	5,965	Rainbow Trout	Catchable
	18,700	Rainbow Trout	Fingerling
	1,056	Yellow Perch	Adult
2003	10,070	Largemouth Bass	Fingerling
2004	980	Bluegill	Adult
	9,500	Largemouth Bass	Fingerling

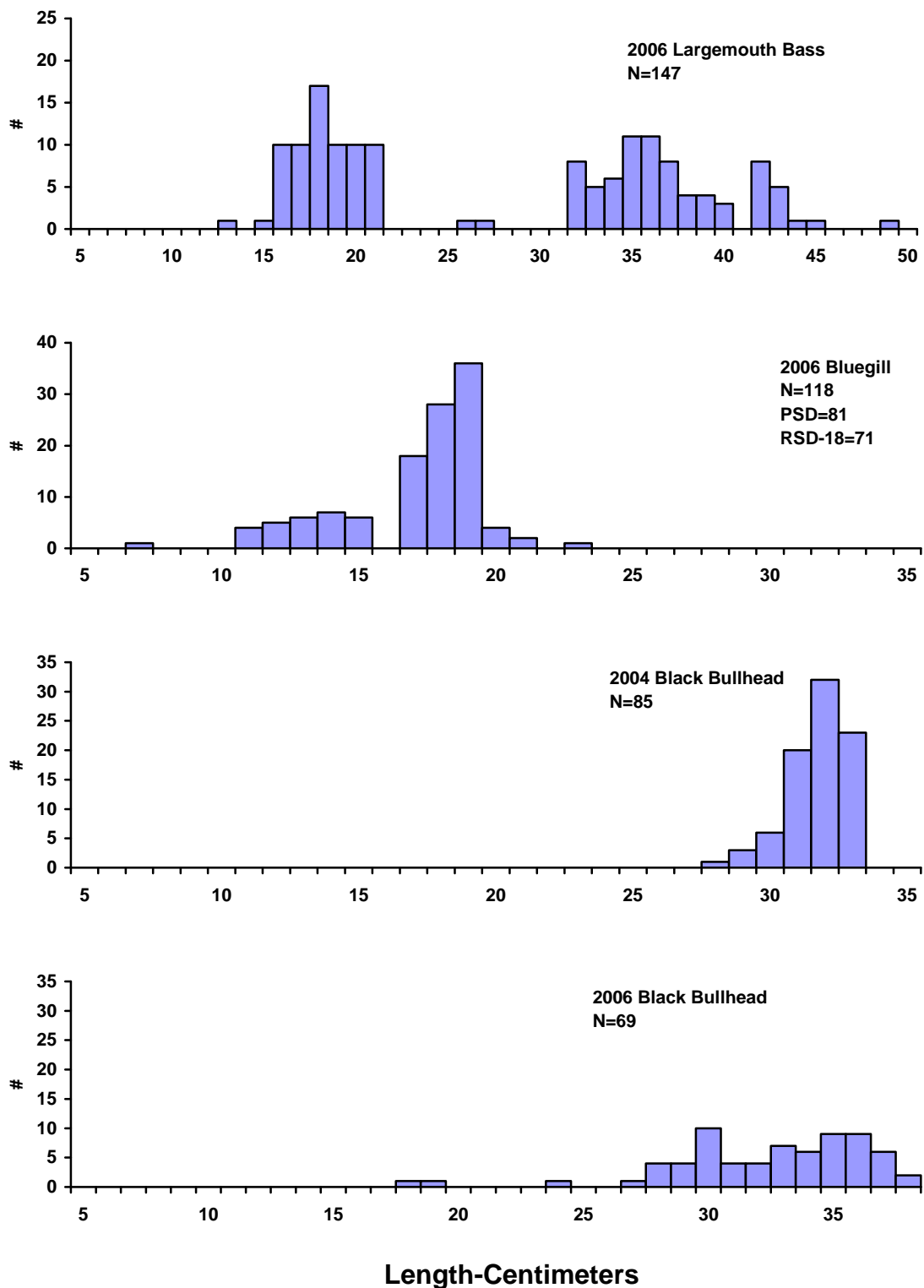


Figure 1. Length frequency histograms of selected species sampled by electrofishing from Lake Lakota, Lincoln County, 2004 and 2006.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill net nights of effort, catch per hour of electrofishing, etc.

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PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
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For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-39

Name: East Vermillion Lake

County: McCook

Legal Description: T102N-R53W-Sec. 14-15, 22-23, 26-27, 33-35

Location from nearest town: 5 miles east, 1 mile south of Canistota, SD

Dates of present survey: July 17-19, 2006 (netting); June 12, 2006 and September 26, 2006 (electrofishing)

Dates of last survey: July 18-20, 2005 (netting); September 7, 2005 (electrofishing)

Primary Game Species	Other Species
Walleye	Largemouth Bass
Black Crappie	Yellow Perch
Bluegill	White Crappie
	Northern Pike
	Channel Catfish
	Common Carp
	White Sucker
	Black Bullhead

PHYSICAL DATA

Surface area: 513 acres

Maximum depth: 23 feet

Volume: 6,600 acre feet

Contour map available? Yes

Lake elevation observed during the survey: Full

Watershed area: 264,789 acres

Mean depth: 12 feet

Shoreline length: 10.1 miles

Date prepared: 1974

Beneficial use classification: (4) warmwater permanent fish propagation, (7) immersion recreation, (8) limited-contact recreation, (9) fish and wildlife propagation and stock watering.

Introduction

East Lake Vermillion, commonly known as Lake Vermillion, is an impoundment formed by a dam constructed across the East Vermillion River in 1958. Battle Creek is a secondary tributary that forms the west arm of the lake. A low-level outlet gate can be opened for flood control purposes. In April and July 1993, the primary and secondary spillways suffered significant damage during flood events. In March 1994, the primary spillway was undermined and collapsed due to the previous year's damage. The primary spillway was repaired by spring 1995.

Ownership of Lake and Adjacent Lakeshore Properties

East Vermillion Lake is owned and managed by the Parks and Wildlife Divisions of the South Dakota Department of Game, Fish and Parks (GFP). Together, the two divisions own 1,826 acres which includes the surface area of the lake. Public use easements grant the public the right to access and use a strip of land 50 feet wide outside the high water contour of the lake.

Fishing Access

The West Recreation Area, a fee area managed by the Parks Division, has a double lane boat ramp with a dock, public toilet, handicapped fishing dock, modern campground, fish cleaning station, swimming beach, and shore fishing access. There is vehicle access to shore-fishing areas in the western arm of the lake. The East Recreation Area, also a fee area managed by the Parks Division, has a double lane boat ramp with a dock, public toilet, campground, and shore fishing access.

Field Observations of Water Quality and Aquatic Vegetation

Scattered beds of sago pondweed (*Potamogeton pectinatus*) were common throughout the lake. Cattails (*Typha spp.*) and duckweed (*Lemna spp.*) were also observed. The water during the survey had a Secchi depth measurement of 64 cm (25 in).

BIOLOGICAL DATA

Methods:

East Vermillion Lake was sampled on July 17-19, 2006 with four overnight gill-net sets and eight overnight trap-net sets. The trap nets are constructed with 19-mm-bar-mesh ($\frac{3}{4}$ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh ($\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, and 2 in) monofilament netting. Two hours of nighttime electrofishing was done on June 12, 2006 to sample the largemouth bass population and September 26, 2006 to evaluate walleye recruitment. Sampling locations are displayed in Figure 5.

Results and Discussion:

Gill Net Catch

Black bullheads (80.8%) dominated the gill net catch in East Vermillion Lake this year (Table 1). Other species sampled included walleye, channel catfish, yellow perch, white sucker, common carp, black crappie, freshwater drum, and white crappie.

Table 1. Total catch from four overnight gill net sets at East Vermillion Lake, McCook County, July 17-19, 2006.

Species	No.	%	CPUE ¹	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	698	80.8	174.5	±23.8	103.7	0	0	109
Walleye	71	8.2	17.8	±3.8	13.5	60	4	98
Channel Catfish	43	5.0	10.8	±1.3	1.2	95	5	110
Yellow Perch	25	2.9	6.3	±2.3	18.6	60	16	104
White Sucker	12	1.4	3.0	±0.9	4.6	100	92	104
Common Carp	12	1.4	3.0	±3.0	1.4	82	0	100
Black Crappie	1	0.1	0.3	±0.3	1.5	--	--	--
Freshwater Drum	1	0.1	0.3	±0.3	0	--	--	--
White Crappie	1	0.1	0.3	±0.3	1.2	--	--	--

* 10 years (1996-2005)

Trap Net Catch

Black bullheads were the most abundant species (99.4%) sampled in the trap nets (Table 2). Ten other species were also sampled.

Table 2. Total catch from eight overnight trap net sets at East Vermillion Lake, McCook County, July 17-19, 2006.

Species	No.	%	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	21,750	99.4	2,718.8	±1,213	347.4	2	0	89
Bluegill	39	0.2	4.9	±3.0	12.0	44	33	131
Channel Catfish	25	0.1	3.1	±1.4	2.2	96	8	95
Common Carp	18	0.1	2.3	±1.3	4.1	80	7	97
White Sucker	17	0.1	2.1	±1.2	2.7	71	65	96
Yellow Perch	12	0.1	1.5	±1.4	1.7	8	8	98
Northern Pike	10	0.0	1.3	±0.5	3.2	10	10	90
Black Crappie	9	0.0	1.1	±1.3	11.3	--	--	--
Green Sunfish	2	0.0	0.3	±0.2	0	--	--	--
Largemouth Bass	2	0.0	0.3	±0.3	0.2	--	--	--
Walleye	1	0.0	0.1	±0.2	1.4	--	--	--

* 10 years (1996-2005)

Electrofishing Catch

Seven largemouth bass were sampled during two hours of nighttime electrofishing on June 12, 2006 (Table 3).

¹ See Appendix A for definitions of CPUE, PSD, and mean Wr.

Table 3. Total catch from two hours of nighttime electrofishing on East Vermillion Lake, McCook County, June 12, 2006.

Species	Number	CPUE	PSD	RSD-P	RSD-M	Mean Wr
Largemouth Bass	7	3.5	100	100	14	120

Largemouth Bass

Management objective: Maintain a largemouth bass fishery with an electrofishing CPUE of at least 20 and RSD-P range of 10-40.

East Vermillion Lake contains a low density (CPUE = 3.5), high quality (PSD = 100, RSD-P = 100) largemouth bass population (Table 4). Seven largemouth bass from five different year classes ranging in length from 419-512 mm (16.5-20.2 in.) were sampled, however, recruitment is lacking. Growth is above the statewide and regional means (Table 5). East Vermillion Lake has a 381 mm (15 in.) minimum length regulation and all of the largemouth bass sampled exceeded 15 inches.

Table 4. Largemouth bass electrofishing CPUE, PSD, RSD-P, and mean Wr in East Vermillion Lake, McCook County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CPUE				9.5				5.5		3.5
PSD				95				73		100
RSD-P				68				55		100
Mean Wr				111				108		120

Table 5. Average back-calculated lengths (mm) for each age class of largemouth bass in East Vermillion Lake, McCook County, 2006.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2000	6	2	167	249	319	366	393	416		
1998	8	1	119	224	269	363	392	411	427	438
1997	9	2	111	235	303	374	404	423	440	451
1995	11	1	140	217	315	392	424	448	464	477
1994	12	1	131	192	240	288	330	378	405	426
All Classes		7	134	223	289	357	389	415	434	448
Statewide Mean			96	182	250	305				
Region III Mean			111	212	287	347				
LLI* Mean			89	178	256	316				

*Large Lakes and Impoundments (>150 acres)

Walleye

Management objective: Maintain a walleye fishery with a gill-net CPUE of at least 15 and PSD range of 30-60.

Walleye gill-net CPUE increased in 2006 and now meets the management objective (Table 6). Good natural reproduction was documented in 2000, 2001 and 2003 (Table 7) but only moderate year classes were produced in 2004 and 2005. Therefore, 16,544 large fingerlings were stocked in October, 2005 to supplement the population.

Walleye growth was slightly better than statewide, regional, and large impoundment means through age-3, but slowed after that (Table 8). Walleye condition was also good (mean $Wr = 98$) and did not vary with length. The length-frequency histograms in Figure 1 illustrate a moderate-density, balanced population containing multiple year classes and an excellent size distribution.

East Vermillion was stocked with small walleye fingerlings marked with oxytetracycline (OTC) in 2006. Fall electrofishing indicated that a strong year class was produced. However, the contribution of stocked fingerlings was small with only 8% of the 50 walleyes examined having OTC marks. Individual age-0 fish varied greatly in size and mean length and condition were lower than observed in the past. A few yearlings from either the moderate 2005 year class or the fall-stocked large fingerlings were captured.

Since 2002, fall electrofishing catch per hour (CPH) of yearling walleyes has been lower than expected given the consistent natural production of moderate to moderately-strong year classes. Likewise, the adult gill net catch seems low for a walleye population with consistent annual recruitment. However, it is interesting that all year classes documented at fall age-0 (except for the very weak 2002 year class) are represented in the gill net catch (Tables 7 and 8). The disparity in abundance of walleyes at fall age-0 and subsequent abundance of older walleyes would suggest high first-winter mortality.

Table 6. Walleye gill net CPUE, PSD, RSD-P and mean Wr in East Vermillion Lake, McCook County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	17.2	26.5	17.5	9.2	14.5	17.5	8.3	4.8	9.8	17.8	13.5
PSD	24	37	50	31	42	53	78	89	50	60	51
RSD-P	4	9	4	3	7	8	25	28	15	4	11
Mean Wr	88	83	87	87	83	91	90	88	92	98	88

*10 years (1996-2005)

Table 7. Age-0 and age-1 walleyes sampled during 2 hours of nighttime electrofishing on East Vermillion Lake, McCook County, 2000-2006.

Year	Stocking	Age-0 CPH	80% C.I.	Mean length (range; mm)	Wr	Age-1 CPH	80% C.I.	Mean length (range; mm)	Wr
2006	fingerling	326	213-439	144 (116-205)	85	2	0-6	254 (212-268)	92
2005	none*	39	27-51	201 (152-230)	98	3	1-5	228 (220-230)	93
2004	none	44	34-54	193 (154-215)	86	1	0-2	303 (290-315)	86
2003	none	84	60-108	178 (134-209)	97	1	0-2	272 (255-286)	87
2002	none	7	2-12	169 (161-185)	96	196	138-254	271 (224-315)	89
2001	none	202	136-268	169 (129-216)	94	43	28-57	296 (245-330)	91
2000	none	231	117-345	200 (150-228)	103				

*16,544 large walleye fingerlings were stocked after electrofishing

Table 8. Average back-calculated lengths (mm) for each age class of walleye in East Vermillion Lake, McCook County, 2006.

Back-calculation Age										
Year Class	Age	N	1	2	3	4	5	6	7	8
2005	1	18	129							
2004	2	19	159	261						
2003	3	20	182	305	380					
2001	5	5	183	295	353	389	431			
2000	6	5	170	271	338	378	413	442		
1999	7	3	183	323	386	417	457	479	497	
1997	9	1	204	329	430	466	480	489	498	510
All Classes		71	173	297	377	412	445	470	497	510
Statewide Mean			168	279	360	425	490			
Region III Mean			173	281	367	435	517			
LLI* Mean			169	280	358	425	494			

*Large Lakes and Impoundments (>150 acres)

Black Crappie

Management objective: Maintain a black crappie fishery with a trap net CPUE of at least 20 and PSD of at least 40.

Black crappie trap-net CPUE has been low due to poor recruitment for several years (Table 9). Black crappies have not been stocked in East Vermillion Lake since 1996.

Table 9. Black crappie trap-net CPUE, PSD, and mean Wr in East Vermillion Lake, McCook County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	13.0	3.9	9.6	10.4	20.9	14.5	2.2	0.5	0.3	1.1	11.3
PSD	95	100	6	99	23	93	95	--	--	--	72
RSD-P	7	68	2	5	19	2	15	--	--	--	15
Mean Wr	124	114	135	118	167	119	107	--	--	--	125

*10 years (1996-2005)

Bluegill

Management objective: Maintain a bluegill fishery with a trap net CPUE of at least 20 and RSD-18 of at least 20.

In 2006, bluegill trap-net CPUE continued to decrease and is well below our management objective, which has only been attained twice in the last 10 years (Table 10). Natural reproduction failed to produce a strong year class in 2005 (Table 11). The bluegills sampled ranged in length from 90-230 mm (3.5-9.0 in) (Figure 3) and growth was better than statewide, regional, and large impoundment means (Table 11). Bluegill condition is excellent (Table 10, Mean Wr=131).

Table 10. Bluegill trap-net CPUE, PSD, RSD-18, RSD-P, and mean Wr in East Vermillion Lake, McCook County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	3.6	6.9	11.5	2.9	9.2	21.0	41.1	14.7	6.6	4.9	12.0
PSD	94	94	80	74	13	100	100	100	100	44	86
RSD-18	6	77	78	43	2	63	98	99	100	33	60
RSD-P	33	58	41	35	1	51	55	78	97	33	46
Mean Wr	122	125	131	141	138	128	112	110	115	131	125

*10 years (1996-2005)

Table 11. Average back-calculated lengths (mm) for each age class of bluegill in East Vermillion Lake, McCook County, 2006.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2005	1	17	54							
2004	2	6	36	100						
2003	3	3	34	109	140					
2001	5	8	45	122	181	203	216			
2000	6	2	56	115	166	202	213	222		
1999	7	1	53	125	146	187	197	210	218	
1998	8	2	41	109	176	190	200	211	221	228
All Classes		39	46	113	162	196	207	215	219	228
Statewide Mean			55	103	141	166	180			
Region III Mean			60	116	157	180	190			
LLI* Mean			62	109	149	173	180			

*Large Lakes and Impoundments (>150 acres)

Black Bullhead

Management objective: Maintain a black bullhead population with a trap-net CPUE of less than 100.

Black bullhead trap-net CPUE increased to 2,718.8 this year indicating a high-density population (Table 12). Over 99% of the bullheads sampled were from the large 2005 year class and were less than 20 cm (8 inches) (Table 12 and Figure 4). Bullhead density this high is capable of negatively impacting gamefish and panfish production and growth. No age-0 black bullheads were found in 2006. Commercial fishermen have removed approximately 25,000 pounds of bullheads each of the last five years.

Table 12. Black bullhead trap-net CPUE and PSD for East Vermillion Lake, McCook County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	51.3	195.7	112.9	107.6	291.8	190.2	473.1	1,574.0	258.8	2,718.8	347.4
PSD	22	95	78	89	30	58	27	19	91	2	53
RSD-P	0	0	5	13	9	7	1	0	0	0	4
Mean Wr	81	124	94	90	100	102	98	93	93	89	97

*10 years (1996-2005)

All Species

Channel catfish abundance has slowly increased (Table 13). CPUE for other species was within previously observed ranges. The high abundance of black bullheads probably affected the CPUE of other species due to gear saturation.

Table 13. Gill-net (GN), electrofishing (EF) and trap-net (TN) CPUE for all fish species sampled in East Vermillion Lake, McCook County, 1997-2006.

Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CCF (GN)	--	---	0.2	0.7	0.2	0.7	3.5	1.5	5.0	10.8
CCF (TN)	--	0.5	0.3	0.7	0.2	0.2	4.7	9.2	6.6	3.1
LMB (EF)	---	--	--	--	--	--	--	5.5	--	3.5
LMB (TN)	0.1	0.6	--	0.1	--	0.5	0.1	0.3	0.3	0.3
NOP (GN)	7.5	3.0	6.0	2.5	1.0	2.5	--	0.3	0.8	--
NOP (TN)	1.9	5.6	2.0	5.0	1.6	8.6	1.3	1.2	0.6	1.3
FRD (GN)	--	--	--	--	--	--	--	--	--	0.3
FRD (TN)	--	--	--	--	--	--	--	--	--	--
SMB (GN)	--	--	--	--	--	--	--	--	--	--
SMB (TN)	0.2	0.1	--	0.4	--	--	--	--	--	--
WAE (GN)	17.2	26.5	17.5	9.2	14.5	17.5	8.3	4.8	9.8	17.8
WAE (TN)	0.9	0.5	0.5	1.6	1.4	3.9	2.1	1.3	0.3	0.1
BLC (GN)	1.2	0.8	2.5	1.0	1.7	3.2	0.8	0.3	--	0.3
BLC (TN)	13.0	3.9	9.6	10.4	20.9	14.5	2.2	0.5	0.3	1.1
BLG (GN)	--	0.3	--	--	0.5	1.2	--	0.5	--	--
BLG (TN)	3.6	6.9	11.5	2.9	9.2	21.0	41.1	14.7	6.6	4.9
GSF (GN)	--	--	--	--	--	--	--	--	--	--
GSF (TN)	--	--	--	--	--	0.1	--	--	--	0.3
HYB (GN)	--	--	--	--	--	--	--	--	--	--
HYB (TN)	--	--	0.1	--	--	0.2	0.1	--	--	--
WHC (GN)	1.0	1.3	0.7	0.2	2.7	2.5	--	0.3	0.3	0.3
WHC (TN)	3.7	0.5	0.4	0.4	4.4	6.4	1.3	1.2	0.3	--
YEP (GN)	1.2	3.8	22.2	8.0	47.2	42.5	28.8	21.3	8.8	6.3
YEP (TN)	0.4	0.5	2.2	1.5	4.0	4.7	1.6	0.6	0.4	1.5
BLB (GN)	112.7	42.5	50.5	59.5	70.5	146.5	233.3	169.5	124.0	174.5
BLB (TN)	51.3	195.7	112.9	107.6	291.8	190.2	473.1	1,574	258.8	2718.8
COC (GN)	9.4	--	0.2	0.2	1.2	0.5	0.3	0.3	0.8	3.0
COC (TN)	--	8.4	2.5	4.4	1.5	6.4	1.2	1.4	6.3	2.3
WHS (GN)	6.5	5.3	4.2	9.0	5.7	0.7	4.5	2.8	4.5	3.0
WHS (TN)	2.8	1.3	1.8	9.2	1.4	4.4	0.8	0.1	1.7	2.1

CCF (Channel Catfish), LMB (Largemouth Bass), NOP (Northern Pike), FRD (Freshwater Drum), SMB (Smallmouth Bass), WAE (Walleye), BLC (Black Crappie), BLG (Bluegill), GSF (Green Sunfish), HYB (Hybrid Sunfish), WHC (White Crappie), YEP (Yellow Perch), BLB (Black Bullhead), COC (Common Carp), WHS (White Sucker)

MANAGEMENT RECOMMENDATIONS

1. Continue to monitor East Vermillion Lake with annual lake surveys. Schedule alternate year electrofishing surveys to sample the largemouth bass population. Stock adult largemouth bass, when available, to supplement the population.
2. Continue fall electrofishing surveys to monitor walleye reproduction, stocking success and recruitment. Stock walleye fingerlings following two consecutive years of poor natural reproduction.
3. Develop a habitat improvement plan for East Vermillion Lake that may include periodic drawdowns, artificial structures, rock spawning reefs and fishing piers.
4. Encourage commercial fishermen and anglers to utilize abundant bullheads.

Table 14. Stocking record for East Vermillion Lake, McCook County, 1991-2006.

Year	Number	Species	Size
1991	6,700	Walleye	Sml. Fingerling
	6,000	Walleye	Lrg. Fingerling
1992	15,000	Largemouth Bass	Sml. Fingerling
	40,690	Largemouth Bass	Med. Fingerling
	12,824	Walleye	Lrg. Fingerling
	902	Walleye	Juvenile
	109	Walleye	Adult
	38,930	Yellow Perch	Fingerling
1995	1,350	Black Crappie	Adult
	27,500	Channel Catfish	Fingerling
	35,700	Fathead Minnow	Adult
	55,000	Walleye	Sml. Fingerling
1996	3,789	Black Crappie	Adult
	51,300	Bluegill	Fingerling
	51,300	Channel Catfish	Fingerling
	5,227	Yellow Perch	Fingerling
1997	102,600	Walleye	Fingerling
1999	51,300	Walleye	Fingerling
2005	16,544	Walleye	Fingerling
2006	51,425	Walleye	Fingerling

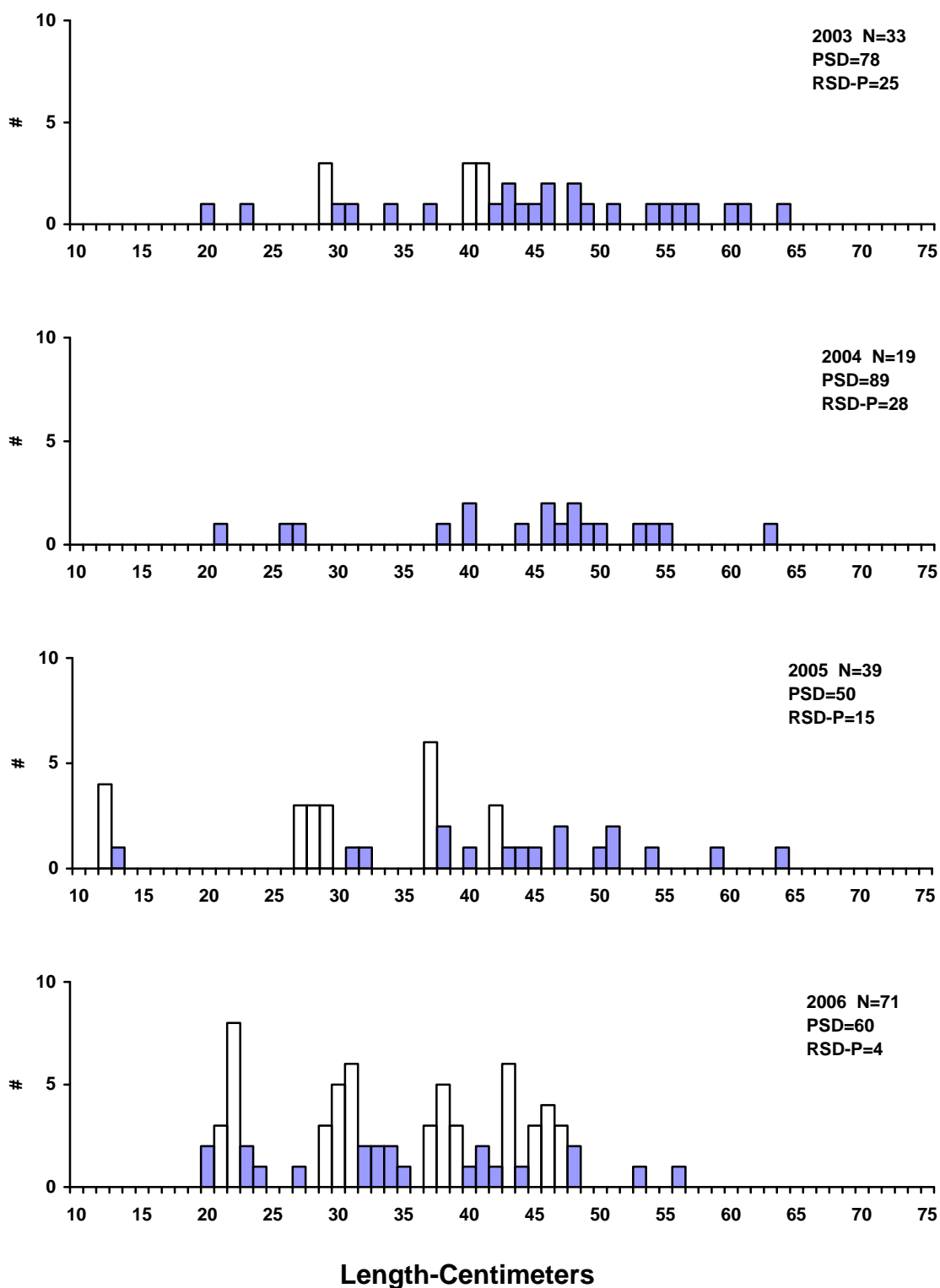


Figure 1. Length frequency histograms for walleye sampled with gill nets in East Vermillion Lake, McCook County, 2003-2006.

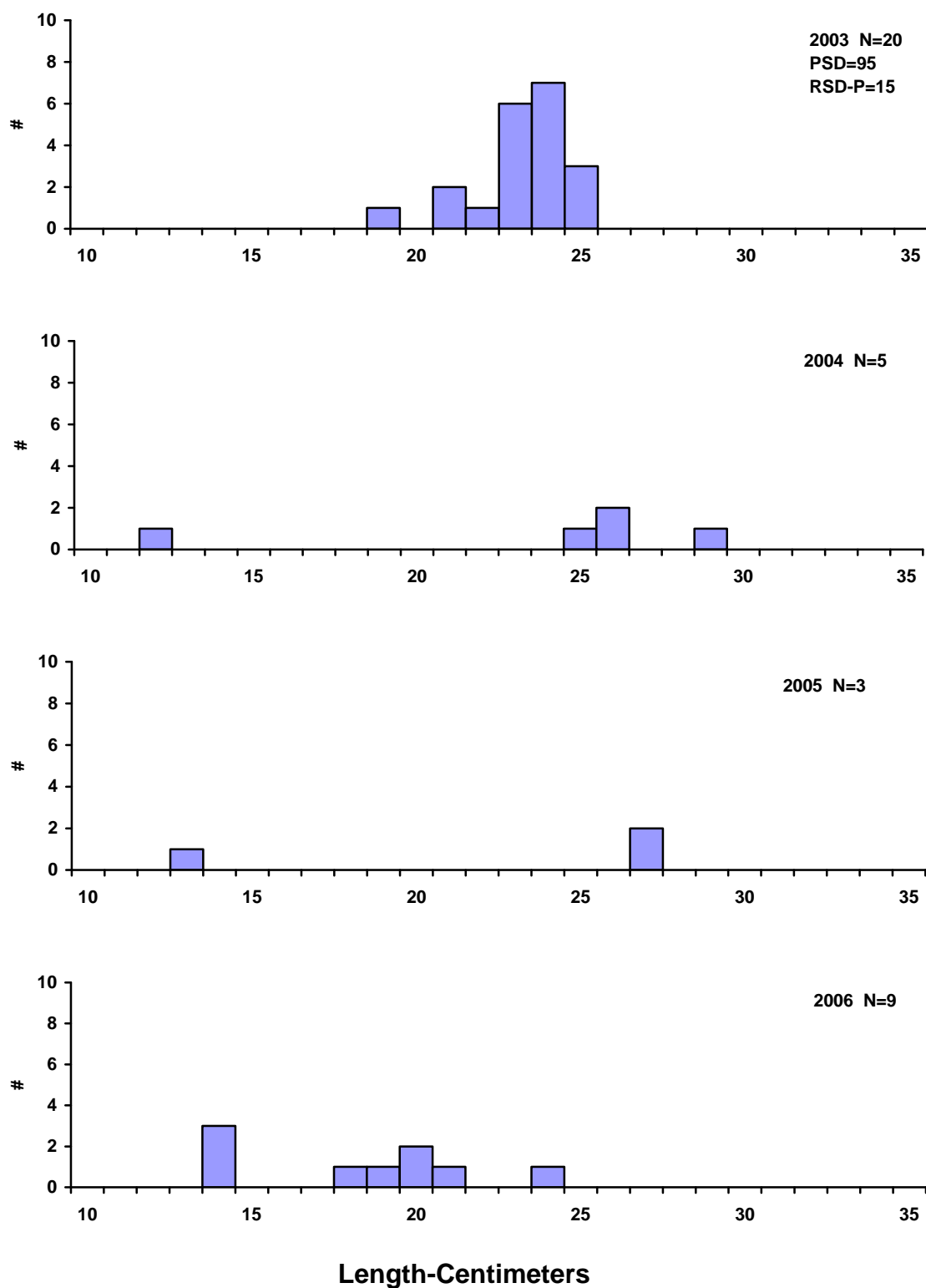


Figure 2. Length frequency histograms for black crappies sampled with trap nets in East Vermillion Lake, McCook County, 2003-2006.

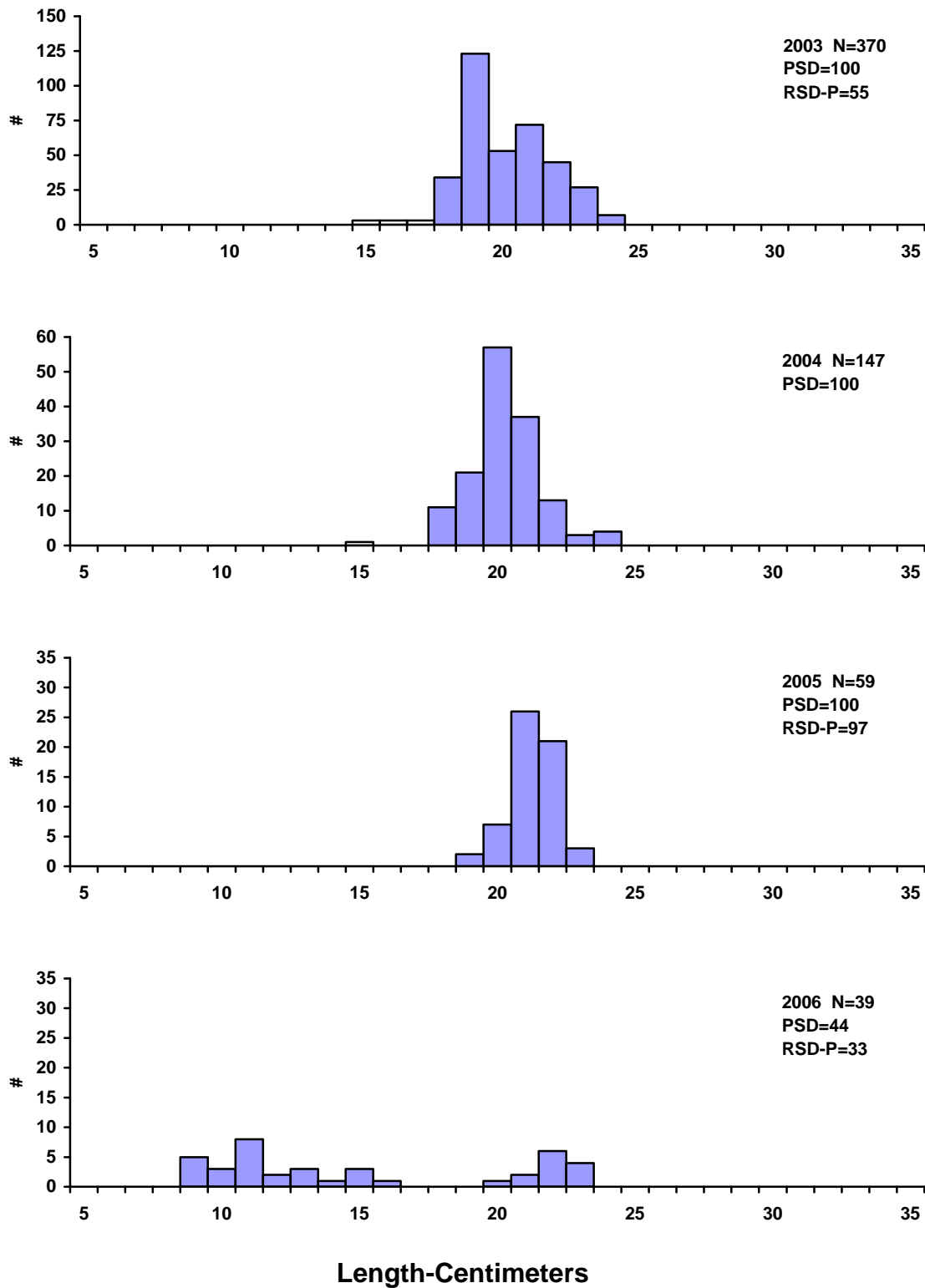


Figure 3. Length frequency histograms for bluegills sampled with trap nets in East Vermillion Lake, McCook County, 2003-2006.

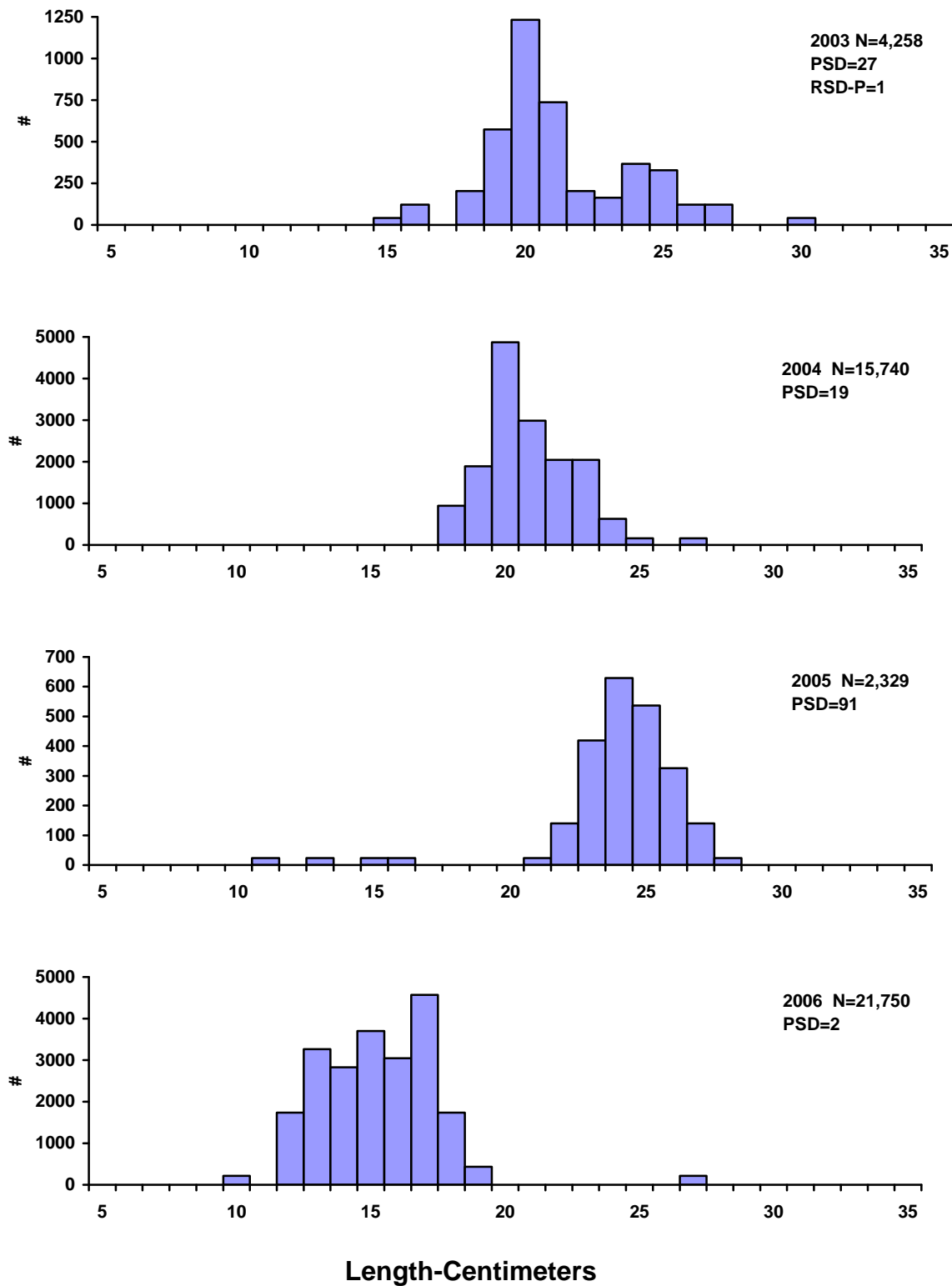


Figure 4. Length frequency histograms for black bullheads sampled with trap nets in East Vermillion Lake, McCook County, 2003-2006.

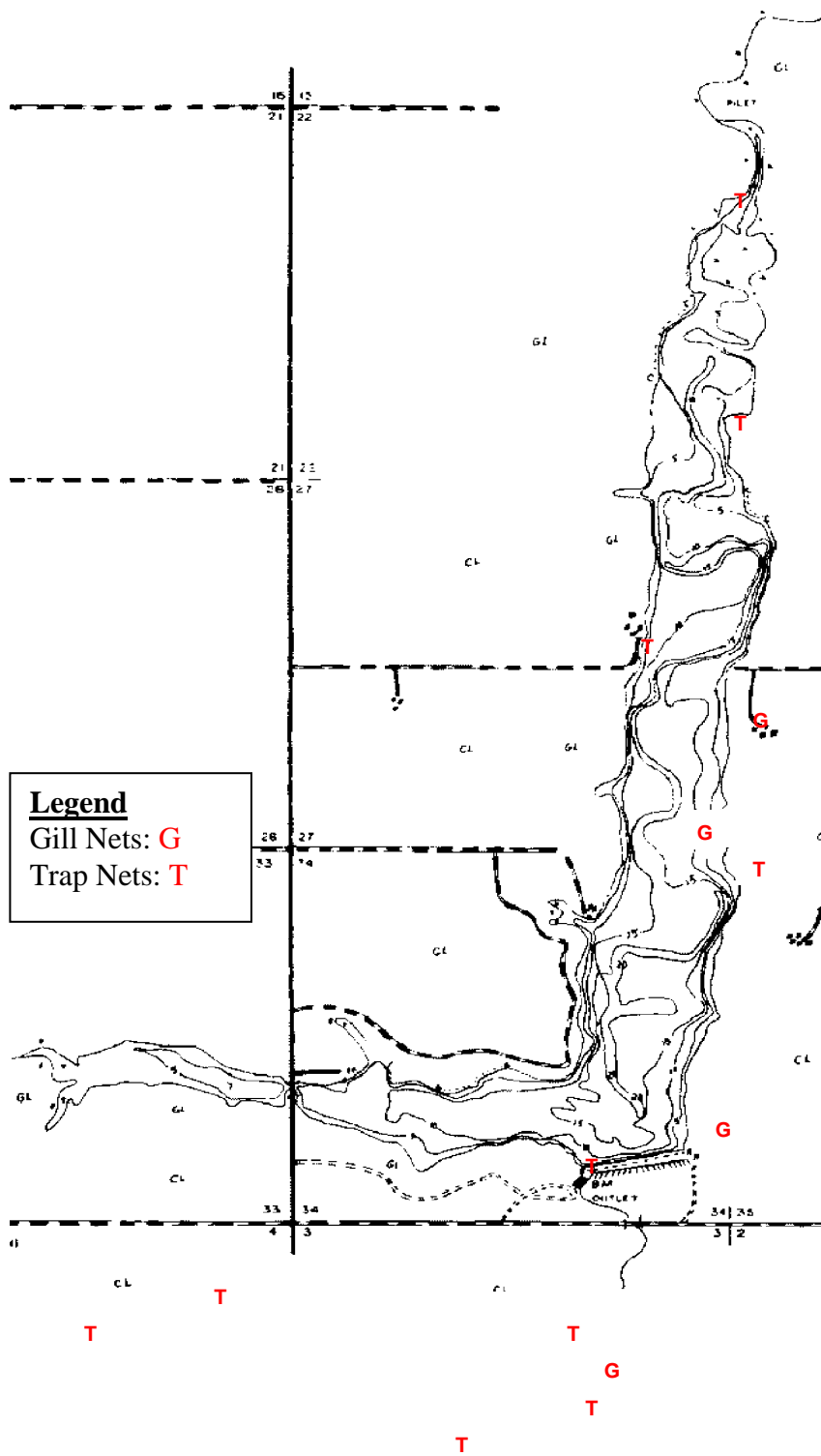


Figure 5. Sampling locations on East Vermillion, McCook County, 2005.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-39

Name: Beaver Lake

County: Minnehaha

Legal Description: T102N-R52W-Sec.14-15

Location from nearest town: 1 mile south and ¾ miles east of Humboldt, SD

Dates of present survey: June 25-27, 2006

Dates of last survey: June 27-29, 2005

Primary Game Species	Secondary and Other Species
Black Crappie	Black Bullhead
Walleye	Common Carp
Yellow Perch	Green Sunfish
	Northern Pike

PHYSICAL DATA

Surface Area: 306 acres

Maximum depth: 10 feet

Volume: No data available

Contour map available: Yes

OHWL elevation: 1651.6

Outlet elevation: 1651.7

Lake elevation observed during the survey: 6 inches low

Beneficial use classifications: (6) warmwater marginal fish propagation, (7) immersion recreation, (8) limited-contact recreation and (9) fish and wildlife propagation.

Watershed area: No data available

Mean depth: 8 feet

Shoreline length: No data available

Date mapped: 1987

Date set: December, 1988

Date set: December, 1988

Introduction

Beaver Lake is a shallow, natural lake located just southeast of Humboldt in west central Minnehaha County. A small, local watershed provides water inputs and overflows exit on the east end. Located relatively close to Sioux Falls, the lake is an important source of water-based recreation for the area.

Ownership of Lake and Adjacent Lakeshore Properties

Beaver Lake is listed as meandered public water in the State of South Dakota Listing of Meandered Lakes. The South Dakota Department of Game, Fish, and Parks (GFP) owns and manages a small lake access area on the southwest corner of the lake. The remaining lakeshore is privately owned.

Fishing Access

The southwest lake access area features a concrete boat ramp, boat dock and vault toilet. Shoreline access is limited to the southwest road right-of-way, especially when the lake is full.

Field Observations of Water Quality and Aquatic Vegetation

The Secchi depth measurement was 46 cm (18 in) during the survey. Thick beds of sago pondweed (*Potamogeton pectinatus*) were found around the entire lake while common cattail (*Typha spp.*) and river bulrush (*Scirpus fluviatilis*) was common in bays and shallow areas. Purple loosestrife (*Lythrum salicaria*) was found on the island and along the south and west shorelines.

BIOLOGICAL DATA

Methods:

Beaver Lake was sampled on June 25-27, 2006 with three overnight gill-net sets and 10 overnight trap-net sets. The trap nets are constructed with 19-mm-bar-mesh ($\frac{3}{4}$ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh ($\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, and 2 in) monofilament netting. Sampling locations are displayed in Figure 3.

Results and Discussion:

Gill Net Catch

Black bullheads (75.9%), common carp (20.0%) and black crappie (2.7%) were the most common species sampled in the gill nets (Table 1). Other species sampled included one walleye and two yellow perch.

Table 1. Total catch from three overnight gill net sets at Beaver Lake, Minnehaha County, June 25-27, 2006.

Species	Number	Percent	CPUE ¹	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	167	75.9	55.7	± 11.7	50.6	0	0	82
Common Carp	44	20.0	14.7	± 3.7	16.0	100	0	86
Black Crappie	6	2.7	2.0	± 1.3	23.7	--	--	--
Yellow Perch	2	0.9	0.7	± 0.4	3.2	--	--	--
Walleye	1	0.5	0.3	± 0.4	4.0	--	--	--

* 5 years (1999, 2001, 2003-2005)

¹ See Appendix A for definitions of CPUE, PSD, RSD-P, and mean Wr.

Trap Net Catch

Black bullheads (84.4%) and black crappies (14.4%) were the most abundant species in the trap-net catch (Table 2). Other species included green sunfish, common carp, orange-spotted sunfish, walleye, northern pike, yellow perch, and largemouth bass.

Table 2. Total catch from ten overnight trap net sets at Beaver Lake, Minnehaha County, June 25-27, 2006.

Species	Number	%	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	3,952	84.4	395.2	± 58.2	362.6	0	0	77
Black Crappie	676	14.4	67.6	± 13.5	123.3	72	0	99
Green Sunfish	33	0.7	3.3	± 2.6	0.2	9	0	98
Common Carp	12	0.3	1.2	± 0.5	7.5	55	9	92
O. S. Sunfish	6	0.1	0.6	± 0.8	0.0	--	--	--
Walleye	2	0.0	0.2	± 0.2	9.6	--	--	--
Northern Pike	1	0.0	0.1	± 0.1	0.3	--	--	--
Yellow Perch	1	0.0	0.1	± 0.1	1.1	--	--	--
Largemouth Bass	1	0.0	0.1	± 0.1	0.0	--	--	--

* 6 years (1995, 1999, 2001, 2003-2005)

Walleye

Management objective: Establish and maintain a walleye population with a gill net CPUE of 20 or greater.

Only one walleye was sampled this year (Table 1) despite considerable stocking efforts since 2002 (Table 11). However, there may be other explanations for the low catch. Gill net saturation by other species (bullheads and carp, Table 1) and abundant submerged vegetation can reduce gill netting effectiveness. In addition, walleye catch rates by anglers were a respectable 0.26 per hour, suggesting a better population than indicated by the netting. The small size of yearling walleyes (Table 4) suggests competition for food may be limiting growth and reducing survival of young fish. Since no age-0 walleyes were sampled by fall electrofishing, 6,666 large fingerling walleyes (5/lb) and 310 juvenile walleyes (2/lb) were stocked in October (Table 12).

Table 3. Walleye gill-net CPUE, PSD, and mean Wr for Beaver Lake, Minnehaha County, 1995-2006. Trap net data used for 2004 and 2005.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE			4.0		6.3		6.7	5.4	5.0	0.3	5.5
PSD			25		79		94	74	90	--	72
RSD-P			17		21		0	13	49	--	20
Mean Wr			93		102		102	81	84	--	92

*5 years (1999, 2001, 2003-2005)

Table 4. Age-0 and age-1 walleyes sampled during 1 hour of nighttime electrofishing on Beaver Lake, Minnehaha County, 2006.

Year	Stocking	Age-0 CPH	80% C.I.	Mean length (range; mm)	Wr	Age-1 CPH	80% C.I.	Mean length (range; mm)	Wr
2006						4		216 (191-230)	100
2005	Large fgl	0				0			
2004	large fg ¹	0				16	8-24	188 (152-277)	81
2003	fingerling	24	12-36	151 (128-202)	83				

¹ 81 juvenile walleyes (6/lb) were stocked on May 28, 2004. Additionally, yearling walleyes were stocked after electrofishing was completed in the fall.

Black Crappie

Management objective: Maintain a black crappie population with a trap net CPUE of 25 or greater and a PSD of 40 or greater.

A large year class of black crappies was naturally-produced in 2001 (Tables 5 and 6). These fish are currently 19-22 cm (7.5-8.7 inches) long (Figure 1) and providing good fishing opportunities. Due to the exceptionally high density of this year class, growth is considerably slower than statewide, regional, and large lake means (Table 6 and Figure 1). Historically, growth has been much better at lower densities. For example, in 1999, age-4 crappies averaged 259 mm (10.2 inches) but in 2006, age-5 fish were only 198 mm (7.8 inches) (Table 6).

Table 5. Black crappie trap-net CPUE, PSD, RSD-P, and mean Wr for Beaver Lake, Minnehaha County, 1999-2006.

	1999	2000	2001	2002	2003	2004	2005	2006	Avg.
CPUE	34.7		1.4		117.6	243.6	245.3	67.6	128.5
PSD	92		64		5	3	1	72	33
RSD-P	48		14		1	0	0	0	13
Mean Wr	104		101		108	95	103	99	102

*5 years (1999, 2001, 2003-2005)

Table 6. Average back-calculated lengths (mm) for each age class of black crappie in Beaver Lake, Minnehaha County, 2006.

Back-calculation Age										
Year Class	Age	N	1	2	3	4	5	6	7	8
2005	1	19	79							
2001	5	613	78	132	165	180	198			
2000	6	39	77	128	151	164	180	194		
All Classes		671	78	130	158	172	189	194		
Statewide Mean			83	147	195	229	249			
Region III Mean			95	167	219	253	274			
LLI* Mean			89	161	210	247	271			

*Large Lakes and Impoundments (>150 acres)

Black Bullhead

Management objective: Maintain a bullhead population with a trap net CPUE of 100 or less.

Beaver Lake has a high-density black bullhead population (Table 8) with few fish longer than 20 cm (8 in) (Figure 2). Figure 2 also suggests the population consists of a single, slow-growing year class. High bullhead abundance can be detrimental to water quality and habitat and the competition for food can affect the growth and recruitment of other fish species. The results of an attempt to reduce bullhead abundance by increasing walleye density through intensive stocking and protecting walleyes with a one fish over 24 inch daily limit are unclear at this time. Bullhead recruitment has been non-existent for several years but may be due to the same, unidentified factors we've observed on other waters throughout the region.

Table 7. Black bullhead trap-net CPUE, PSD, RSD-P, and mean Wr for Beaver Lake, Minnehaha County, 1999-2006.

	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	238.5		91.9		300.8	1,105	423.1	395.2	431.9
PSD	83		48		50	0	0	0	36
RSD-P	0		0		3	0	0	0	1
Mean Wr	88		98		86	83	96	77	90

*5 years (1999, 2001, 2003-2005)

All Species

Common carp abundance has decreased slightly since they first appeared in 2001 and produced a single large year class (Table 9). An expanding carp population could place additional stress on the fishery.

Table 8. Gill-net (GN) and trap-net (TN) CPUE for all fish species sampled in Beaver Lake, Minnehaha County, 1997-2006.

Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
NOP (GN)			--		--		1.7	--	0.3	--
NOP (TN)			--		0.1		0.2	0.7	0.6	0.1
WAE (GN)			4.0		6.3		6.7	1.5	1.3	0.4
WAE (TN)			0.3		0.3		1.2	5.4	5.0	0.1
BLC (GN)			50.0		0.3		26.7	8.5	7.3	2.0
BLC (TN)			34.7		1.4		117.6	243.6	245.3	67.6
GSF (GN)			0.3		--		--	--	--	--
GSF (TN)			41.4		--		0.1	0.7	0.4	--
OSF (GN)			--		--		--	--	--	--
OSF (TN)			--		--		--	0.1	0.1	0.6
YEP (GN)			0.7		11.7		1.0	0.5	1.8	0.7
YEP (TN)			0.1		1.5		1.6	1.0	0.2	0.1
BLB (GN)			114.3		45.7		42.0	30.0	21.0	55.7
BLB (TN)			238.5		91.9		300.8	1,105.0	423.1	395.2
COC (GN)			--		1.0		23.0	28.0	27.8	14.7
COC (TN)			--		0.6		31.1	10.3	2.8	1.2
WHS (GN)			--		--		--	--	--	--
WHS (TN)			--		--		--	0.5	--	--

NOP (Northern Pike), WAE (Walleye), BLC (Black Crappie), GSF (Green Sunfish), OSF (Orangespotted Sunfish), YEP (Yellow Perch), BLB (Black Bullhead), COC (Common Carp), WHS (White Sucker)

Creel Survey Results

A creel survey was conducted on Beaver Lake from May through August 2004-2006 to obtain baseline data on marginal lakes and to monitor the effects of a one walleye over 24 inches regulation. Fishing pressure declined to 5,186 hours (Table 9) (16.9 hours per acre) during the summer of 2006. Most of the pressure (67%) occurred on weekends and only 14.6% was from boat anglers, despite improved boating access facilities. Average trip length was 1.74 hours. Of the parties interviewed, 16% were primarily targeting walleyes, 52% were targeting black crappies and 6% were targeting bullheads. All of parties interviewed were South Dakota residents.

Black crappie anglers enjoyed high catch rates (Table 10), especially in May and they harvested over two-thirds of the fish caught. Anglers caught an estimated 1,346 walleyes but none were harvested due to the special regulation. Anglers also caught an estimated 13,997 bullheads, but few were large enough to harvest (Table 9).

Table 9. Total estimates of fishing pressure and catch (harvest) of fish in Beaver Lake from May through August 2004, 2005 and 2006.

	Fishing Pressure (Hours)	Walleye Catch (Harvest)	Common Carp Catch (Harvest)	Black Bullhead Catch (Harvest)	Black Crappie Catch (Harvest)
2004	2,586	2,725 (19)	435 (85)	10,047 (669)	827 (51)
2005	9,110	5,978 (0)	166 (0)	21,927 (451)	6,674 (1,458)
2006	5,186	1,346 (0)	40 (20)	13,997 (1,943)	12,076 (8,583)

Table 10. Total number of angler interviews and estimates of hourly catch rate (harvest rate) of fish in Beaver Lake from May through August 2004, 2005 and 2006.

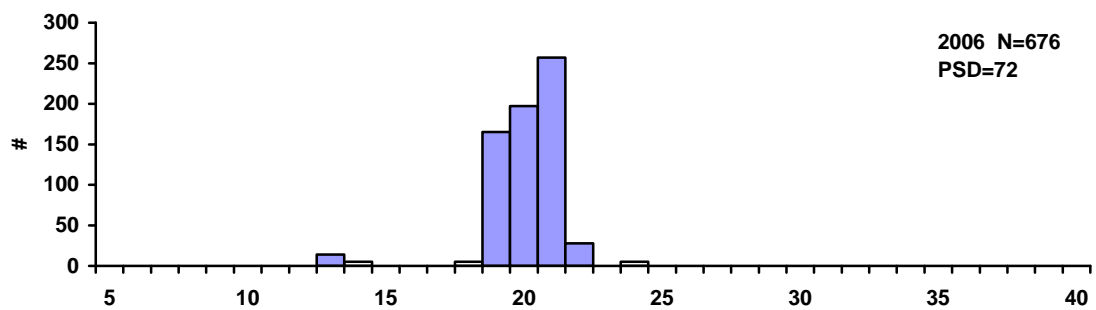
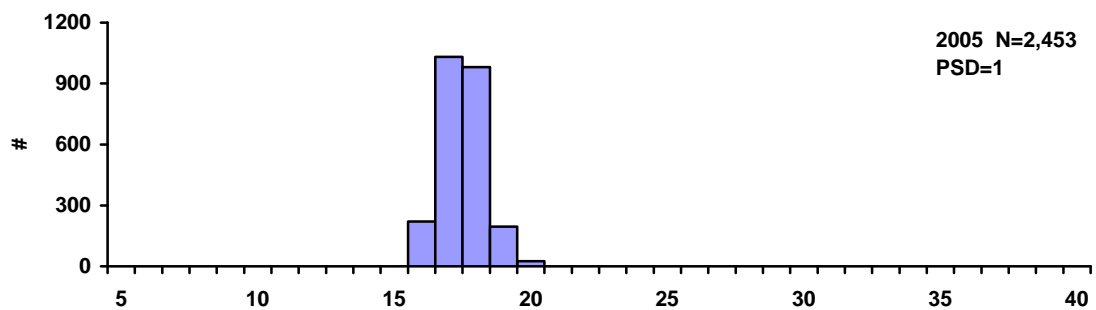
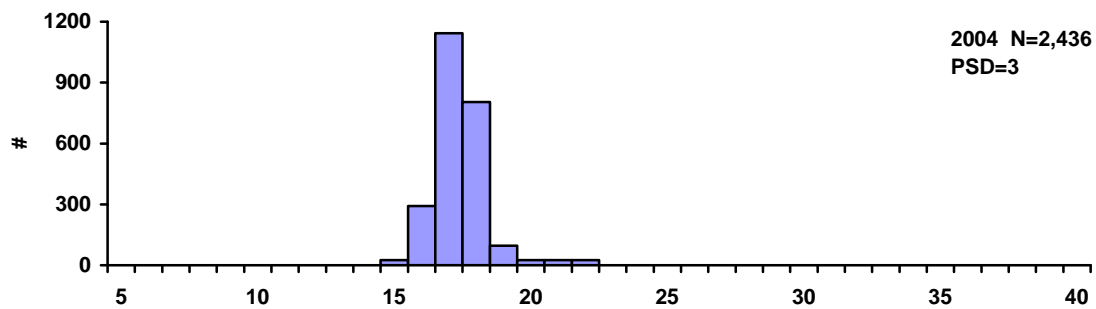
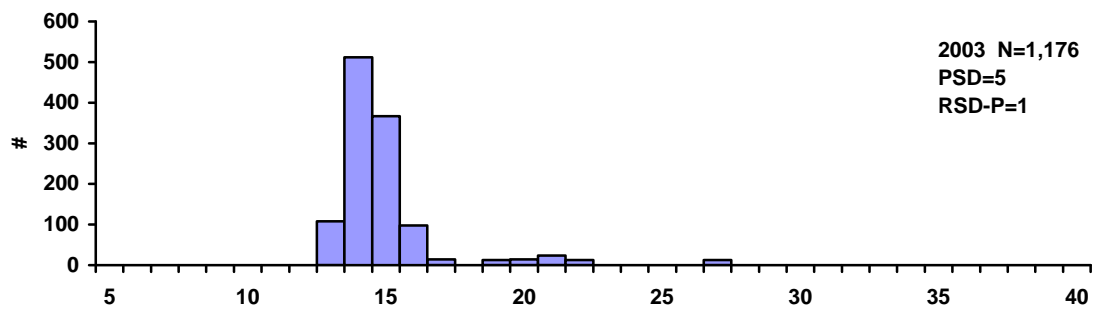
	Number of Interviews	Walleye Catch (Harvest)	Common Carp Catch (Harvest)	Black Bullhead Catch (Harvest)	Black Crappie Catch (Harvest)
2004	70	1.05 (0.007)	0.17 (0.03)	3.88 (0.26)	0.32 (0.02)
2005	211	0.66 (0.0)	0.02 (0.0)	2.41 (0.05)	0.73 (0.16)
2006	139	0.26 (0.0)	0.008 (0.004)	2.70 (0.37)	2.33 (1.66)

MANAGEMENT RECOMMENDATIONS

1. Continue to evaluate the effects of the one walleye over 24 inches regulation. Monitor the fish populations, especially the bullhead and walleye populations by conducting annual lake surveys and stock walleye fingerlings, large fingerlings and adults as needed to increase walleye abundance.

Table 11. Stocking record for Beaver Lake, Minnehaha County, 1991-2006.

Year	Number	Species	Size
1991	274	Northern Pike	Adult
1992	90	Northern Pike	Adult
1993	600	Black Crappie	Adult
1994	500	Black Crappie	Adult
1998	33,000	Walleye	Fingerling
	133	Walleye	Lrg. Fingerling
	73	Walleye	Adult
1999	30,000	Walleye	Fingerling
2002	28,400	Walleye	Fingerling
2003	300,000	Walleye	Fry
	3,056	Walleye	Lrg. Fingerling
	5,412	Yellow Perch	Fingerling
2004	126	Walleye	Juvenile
	1,730	Walleye	Adult
2005	20,460	Fathead Minnow	Adult
	10,240	Walleye	Lrg. Fingerling
2006	30,250	Walleye	Fingerling
	6,666	Walleye	Lrg. Fingerling
	310	Walleye	Juvenile
	24,700	Fathead Minnow	Adult



Length-Centimeters

Figure 1. Length frequency histograms for black crappie sampled with trap nets in Beaver Lake, Minnehaha County, 2003, 2004, 2005 and 2006.

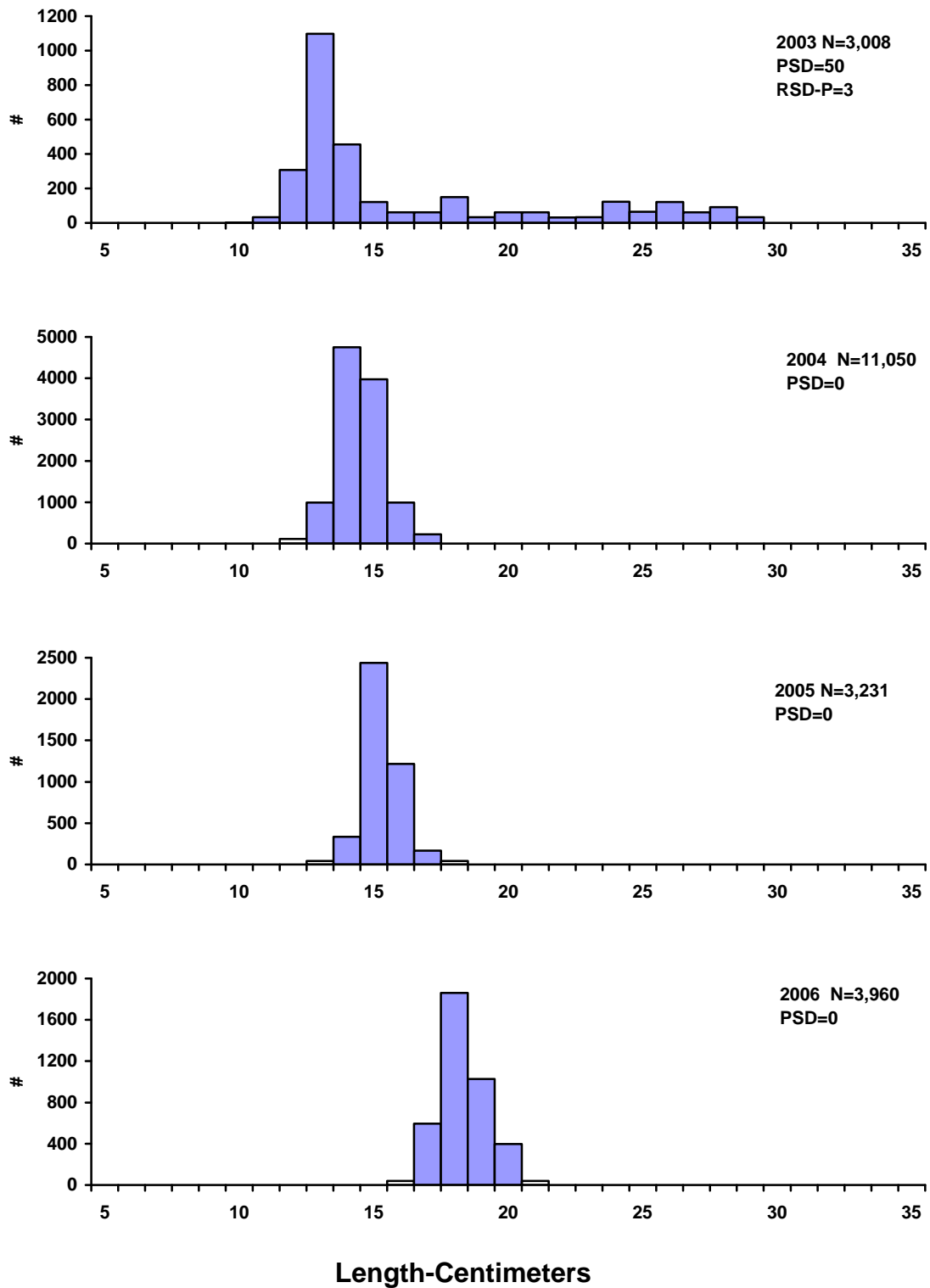


Figure 2. Length frequency histograms for black bullheads sampled with trap nets in Beaver Lake, Minnehaha County, 2003, 2004, 2005, and 2006.

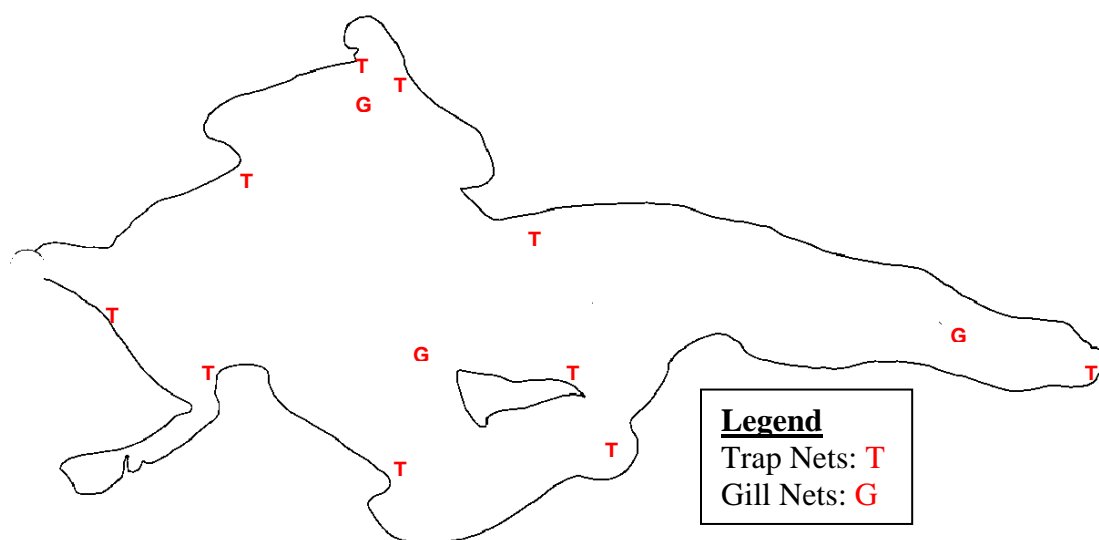


Figure 3. Sampling locations on Beaver Lake, Minnehaha County, 2006.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-39

Name: Diamond Lake

County: Minnehaha

Legal Description: T104N-R52W-Sec. 5

Location from nearest town: 13 miles north and 2 miles west of Humboldt, SD

Dates of present survey: July 18-19, 2006

Date last surveyed: July 19-21, 2004

Primary Game and Forage Species	Secondary and Other Species
Walleye	Black Bullhead
Yellow Perch	Northern Pike
	White Sucker
	Common Carp
	Green Sunfish
	Orange-spotted Sunfish
	Channel Catfish
	Black Crappie
	Bluegill

PHYSICAL DATA

Surface Area: 256 acres

Maximum depth: 12 feet

Volume: No data available

Contour map available: No

Lake elevation observed during the survey: 16 inches low

Beneficial use classifications: (5) warmwater semi-permanent fish propagation, (7) immersion recreation, (8) limited-contact recreation and (9) fish and wildlife propagation and stock watering.

Watershed area: No data available

Mean depth: 6 feet

Shoreline length: No data

Date mapped: 2002 (shoreline)

Ownership of Lake and Adjacent Lakeshore Properties

Diamond Lake is listed as meandered public water in the State of South Dakota Listing of Meandered Lakes. The South Dakota Department of Game, Fish, and Parks (GFP) owns the majority of the lake basin as a Game Production Area and manages the fishery. The remainder of the shoreline is privately owned.

Fishing Access

The Diamond Lake Access Area was upgraded in 2005. It consists of a new concrete plank boat ramp, small gravel parking area, a new boat dock and a toilet. Shore fishing access is available in the access area and along the county road grade on the south end of the lake.

Field Observations of Water Quality and Aquatic Vegetation

The water was fairly turbid during the survey with a Secchi depth measurement of 37 cm (14.5 in). A few scattered stands of sago pondweed (*Potamogeton pectinatus*) were observed in shallow areas and some common cattail (*Typha spp.*) exists in shallow bays.

BIOLOGICAL DATA

Methods:

Diamond Lake was sampled on July 18-19, 2006 with three overnight gill net sets and ten overnight trap net sets. The trap nets are constructed with 19-mm-bar-mesh ($\frac{3}{4}$ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh ($\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, and 2 in) monofilament netting. Sampling locations are displayed in Figure 4.

Results and Discussion:

Gill Net Catch

Common carp (46.4%) and black bullheads (31.0%) comprised the majority of the gill-net sample (Table 1). Yellow perch and walleye were also sampled.

Table 1. Total catch from three overnight gill net sets at Diamond Lake, Minnehaha County, July 18-19, 2006.

Species	Number	Percent	CPUE ¹	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Common Carp	150	46.4	50.0	± 16.1	7.9	6	4	90
Black Bullhead	100	31.0	33.3	± 10.3	134.2	13	0	74
Yellow Perch	45	13.6	15.0	± 8.4	239.9	87	16	81
Walleye	30	9.0	10.0	± 6.2	4.9	49	11	85

* 4 year (1998, 2000, 2002, 2004)

Trap Net Catch

Black bullheads (91.0%) and common carp (6.2%) dominated the trap net sample (Table 2). Other species caught included walleye, yellow perch, green sunfish, white sucker, northern pike, black crappie, and bluegill.

¹ See Appendix A for definitions of CPUE, PSD, and mean Wr.

Table 2. Total catch from ten overnight trap net sets at Diamond Lake, Minnehaha County, July 18-19, 2006.

Species	Number	Percent	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	2,894	91.0	289.4	± 84.3	934.6	9	0	85
Common Carp	198	6.2	19.8	± 4.0	3.9	11	9	99
Walleye	53	1.7	5.3	± 2.4	0.1	52	22	89
Yellow Perch	19	0.6	1.9	± 1.1	11.3	95	16	92
Green Sunfish	7	0.2	0.7	± 0.5	0.2	--	--	--
White Sucker	5	0.2	0.5	± 0.3	0.2	--	--	--
Northern Pike	3	0.1	0.3	± 0.3	2.0	--	--	--
Black Crappie	1	0.0	0.1	± 0.1	0.0	--	--	--
Bluegill	1	0.0	0.1	± 0.1	0.0	--	--	--

* 6 years (1991, 1994, 1998, 2000, 2002, 2004)

Walleye

Management objective: Maintain a high density walleye population capable of controlling overabundant black bullheads.

On January 1, 2003, the daily limit for walleyes in Diamond Lake was changed to one fish that must be at least 61 cm (24 in) long. The objective of the regulation was to create a high-density population of large walleyes able to control an overabundant black bullhead population that has existed in the lake for years. Fingerling and adult walleyes have been stocked to further increase the population (Table 11).

Although walleye gill net CPUE has increased (Table 3) overall abundance may still be below what is needed to control the black bullhead population.

Adult stockings have made it difficult to evaluate walleye growth in Diamond Lake. Lengths-at-age for larger walleyes exceeded the statewide and regional averages, but this may reflect growth before they were stocked (Table 4). However, incremental growth of 4-7 year old walleyes in 2006 was relatively slow. Yearling walleyes were also growing slowly (Table 4) and in below average condition (mean Wr = 85).

Table 3. Walleye gill-net CPUE, PSD, RSD-P, and mean Wr for Diamond Lake, Minnehaha County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE		0.0		11.5		5.7		2.3		10.0	4.9
PSD		--		88		93		100		49	94
RSD-P		--		0		21		17		11	13
Mean Wr		--		97		102		92		85	97

*4 years (1998, 2000, 2002, 2004)

Table 4. Average back-calculated lengths (mm) for each age class of walleye in Diamond Lake, Minnehaha County, 2006.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2005	1	41	124							
2004	2	10	166	334						
2003	3	16	130	200	351					
2001	5	3	156	254	393	445	494			
2000	6	3	162	307	421	467	498	517		
1999	7	1	135	257	350	401	470	484	492	
All Classes		74	134	257	366	448	492	509	492	
Statewide Mean			168	279	360	425	490			
Region III Mean			173	281	367	435	517			
LLI* Mean			169	280	358	425	494			

Yellow Perch

Management objective: Maintain a yellow perch population with a gill-net CPUE of at least 50 and a PSD range of 30-60.

Yellow perch gill net CPUE increased from 9.3 in 2004 to 15.0 in 2006 (Table 5). The mean length of the yellow perch sampled was 23 cm (9.1 in) long (Figure 2). We stocked 1,771 fin clipped adult yellow perch in the spring of 2006. Thirty (67%) of the 45 perch sampled in gill nets in 2006 were fin clipped. With at least two thirds of the sample coming from stocked fish, yellow perch growth (Table 6) may not reflect the actual growth of yellow perch in Diamond Lake.

Table 5. Yellow perch gill-net CPUE, PSD, RSD-P, and mean Wr for Diamond Lake, Minnehaha County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE		812.0		65.0		73.3		9.3		15.0	239.9
PSD		60		2		8		93		87	41
RSD-P		13		0		0		0		16	3
Mean Wr		90		87		107		97		81	95

*4 years (1998, 2000, 2002, 2004)

Table 6. Average back-calculated lengths (mm) for each age class of yellow perch in Diamond Lake, Minnehaha County, 2006.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2004	2	21	94	184						
2003	3	12	93	160	216					
2002	4	7	76	145	205	237				
2001	5	4	92	148	190	219	243			
1999	7	1	91	147	239	264	284	303	308	
All Classes		45	91	168	209	233	251	303	308	
Statewide Mean			86	145	190	220	242			
Region III Mean			94	159	208	242	281			
LLI Mean			86	146	192	225	249			

Black Bullhead

Management objective: Maintain a black bullhead population with a trap-net net CPUE of less than 100.

The black bullhead trap net CPUE increased to 289.4 after being near the objective of 100 in 2004 (Table 7). Still, bullhead abundance remains low relative to the 1998-2002 populations. A PSD of only 9 and RSD-P of 0 reflect a population with mostly small individuals (Figure 3). The mean length sampled bullheads was 172 mm (6.8 in).

Table 7. Black bullhead trap-net CPUE, PSD, RSD-P, and mean Wr for Diamond Lake, Minnehaha County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CPUE		1381.4		2000.0		1,229.4		104.7		289.4
PSD		2		0		63		69		9
RSD-P		0		0		0		7		0
Mean Wr		--		--		105		86		85

All Species

Common carp abundance increased substantially with a large year class produced in 2005 (Table 8). The high abundance of common carp could place additional stress on the walleye and yellow perch fishery (Table 8).

Table 8. Gill-net (GN) and trap-net (TN) CPUE for all fish species sampled in Diamond Lake, Minnehaha County, 1997-2006.

Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
BLB (GN)		115.5		206.5		106.7		108.0		33.3
BLB (TN)		1,381.4		2000.0		1,229.4		104.7		289.4
BLC (GN)		--		--		--		--		--
BLC (TN)		--		--		--		0.1		0.1
BLG (GN)		--		--		--		--		--
BLG (TN)		--		--		--		0.1		0.1
CCF (GN)		--		--		--		--		--
CCF (TN)		--		--		--		0.1		--
COC (GN)		5.0		0.5		21.7		4.3		50.0
COC (TN)		7.0		1.0		8.0		9.5		19.8
GSF (GN)		--		--		--		--		--
GSF (TN)		0.4		--		--		0.7		0.7
HYB (GN)		--		--		--		--		--
HYB (TN)		--		--		--		0.1		--
NOP (GN)		5.5		4.0		1.3		0.3		--
NOP (TN)		4.0		0.4		--		0.5		0.3
OSF (GN)		--		--		--		--		--
OSF (TN)		--		--		--		0.2		--
WAE (GN)		--		11.5		5.7		2.3		10.0
WAE (TN)		--		--		--		0.8		5.3
WHS (GN)		--		0.5		--		--		--
WHS (TN)		0.4		0.2		0.3		0.3		0.5
YEP (GN)		812.0		65.0		73.3		9.3		14.7
YEP (TN)		44.2		1.4		16.0		0.7		1.9

BLB (Black Bullhead), BLC (Black Crappie), BLG (Bluegill), CCF (Channel Catfish), COC (Common Carp), GSF (Green Sunfish), HYB (Hybrid Sunfish), NOP (Northern Pike), OSF (Orangespotted Sunfish), WAE (Walleye), WHS (White Sucker), YEP (Yellow Perch)

Creel Survey Results

A creel survey was conducted on Diamond Lake from May through August 2004-2006 to obtain baseline data on marginal lakes and to monitor the effect of the one walleye over 24 inches daily limit. Anglers averaged 3,628 hours (Table 9) fishing Diamond Lake, over 14 hours per acre. Average trip length was 2.89 hours in 2004, 2.72 hours in 2005 and 2.42 hours in 2006. All of the angling parties were residents of South Dakota.

Anglers enjoyed good fishing from June through August with catch rates ranging from 0.6 fish/h to 1.3 fish/h (all species). Walleye and northern pike catch was highest in 2004 and declined in 2005 and 2006 (Tables 9 and 10). Yellow perch and black bullhead catch was highest in 2004 and lowest in 2005.

Yellow perch catch and harvest rates were relatively low throughout the summer.

Anglers harvested a high percentage of yellow perch and black bullheads when the size was acceptable.

Table 9. Monthly estimates of fishing pressure and catch (harvest) of fish in Diamond Lake from May through August 2004-2006.

	Fishing Pressure (Hours)	Walleye Catch (Harvest)	Northern Pike Catch (Harvest)	Yellow Perch Catch (Harvest)	Black Bullhead Catch (Harvest)
2004	4,077	2,177 (109)	239 (18)	927 (161)	2,124 (944)
2005	4,354	821 (0)	88 (0)	160 (81)	1,411 (0)
2006	2,454	96 (0)	0 (0)	311 (218)	1,040 (265)

Table 10. Monthly number of angler interviews and estimates of hourly catch rate (harvest rate) of fish in Diamond Lake from May through August 2004-2006.

	Number of Interviews	Walleye Catch (Harvest)	Northern Pike Catch (Harvest)	Yellow Perch Catch (Harvest)	Black Bullhead Catch (Harvest)
2004	86	0.53 (0.03)	0.06 (0.004)	0.23 (0.04)	0.52 (0.23)
2005	95	0.19 (0)	0.02 (0)	0.04 (0.02)	0.32 (0)
2006	56	0.039 (0)	0 (0)	0.127 (0.089)	0.42 (0.11)

MANAGEMENT RECOMMENDATIONS

1. Continue to evaluate the effectiveness of a one fish over 24 inch daily bag limit to control overabundant bullhead populations.
2. Stock large fingerling and/or adult walleyes to maintain a high-density population. Monitor growth and condition during lake surveys to watch for signs of slowed growth.

Table 11. Stocking record for Diamond Lake, Minnehaha County, 1990-2006.

Year	Number	Species	Size
1990	110	Northern Pike	Adult
1992	12,690	Northern Pike	Fingerling
	25,250	Yellow Perch	Fingerling
1993	37,000	Yellow Perch	Fingerling
1995	3,050	Yellow Perch	Adult
1997	2,640	Yellow Perch	Adult
	19,485	Yellow Perch	Fingerling
1998	27,700	Walleye	Fingerling
1999	25,600	Walleye	Fingerling
2000	27,000	Walleye	Fingerling
2001	25,600	Walleye	Fingerling
2002	263	Walleye	Adult
2003	149	Walleye	Adult
	51,200	Walleye	Fingerling
2005	24	Walleye	Adult
	8,320	Walleye	Fingerling
2006	25,680	Walleye	Fingerling
	1,771	Yellow Perch	Adult
	1,107	Yellow Perch	Juvenile
	6,645	Walleye	Large Fingerling

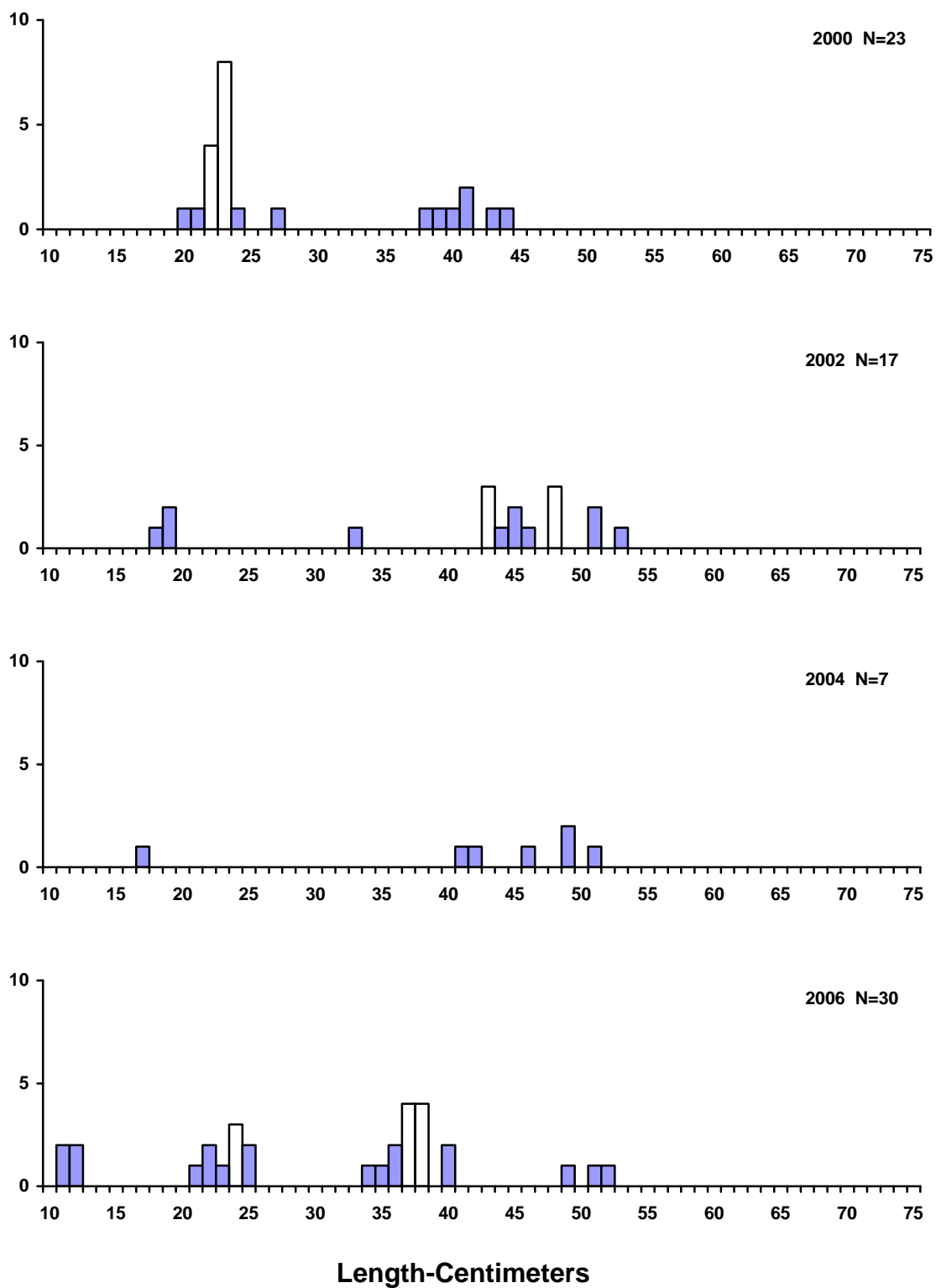


Figure 1. Length frequency histogram for walleye sampled with gill nets in Diamond Lake, Minnehaha County, 2000, 2002, 2004 and 2006.

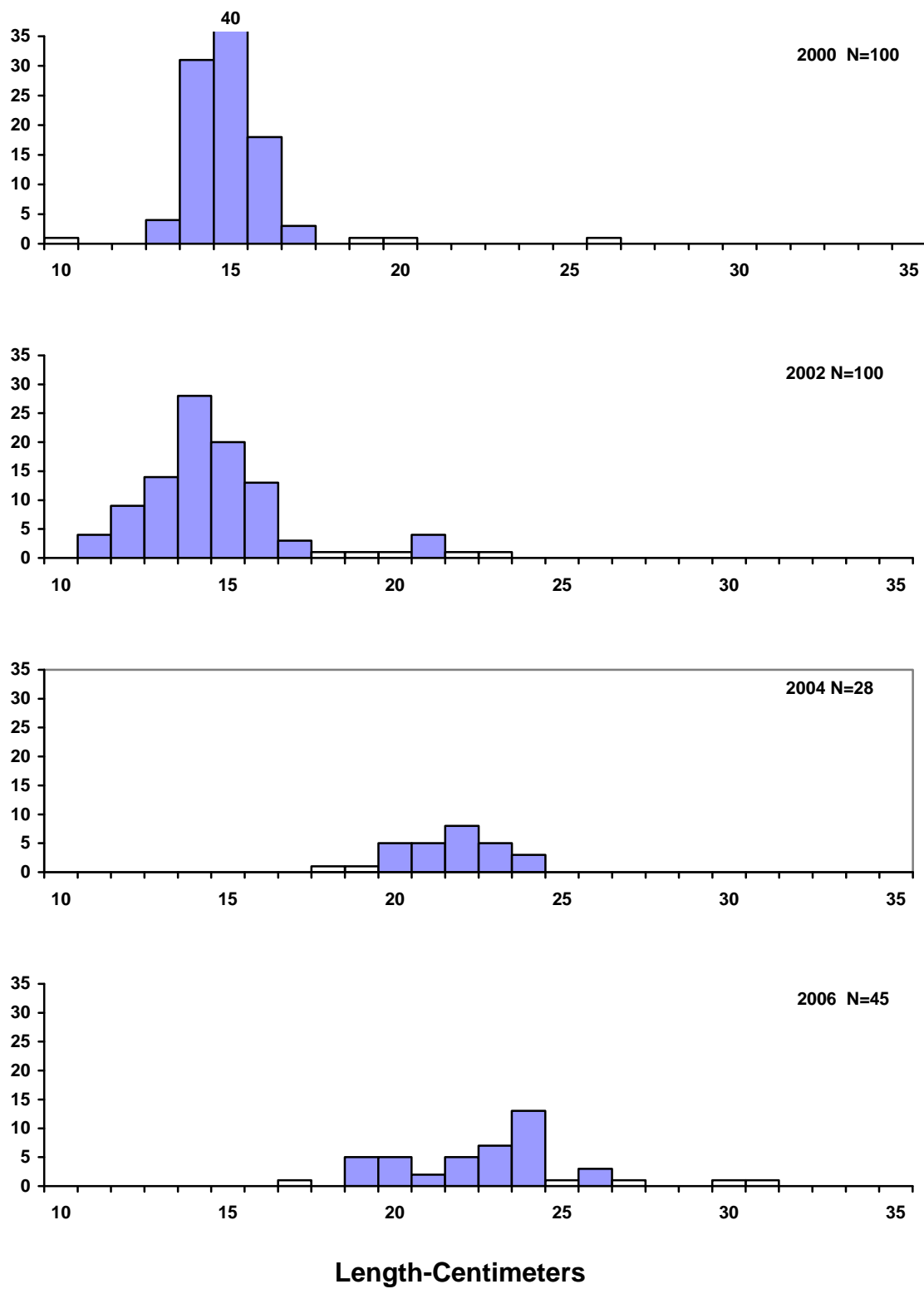


Figure 2. Length frequency histograms for yellow perch sampled with gill nets in Diamond Lake, Minnehaha County, 2000, 2002, 2004 and 2006.

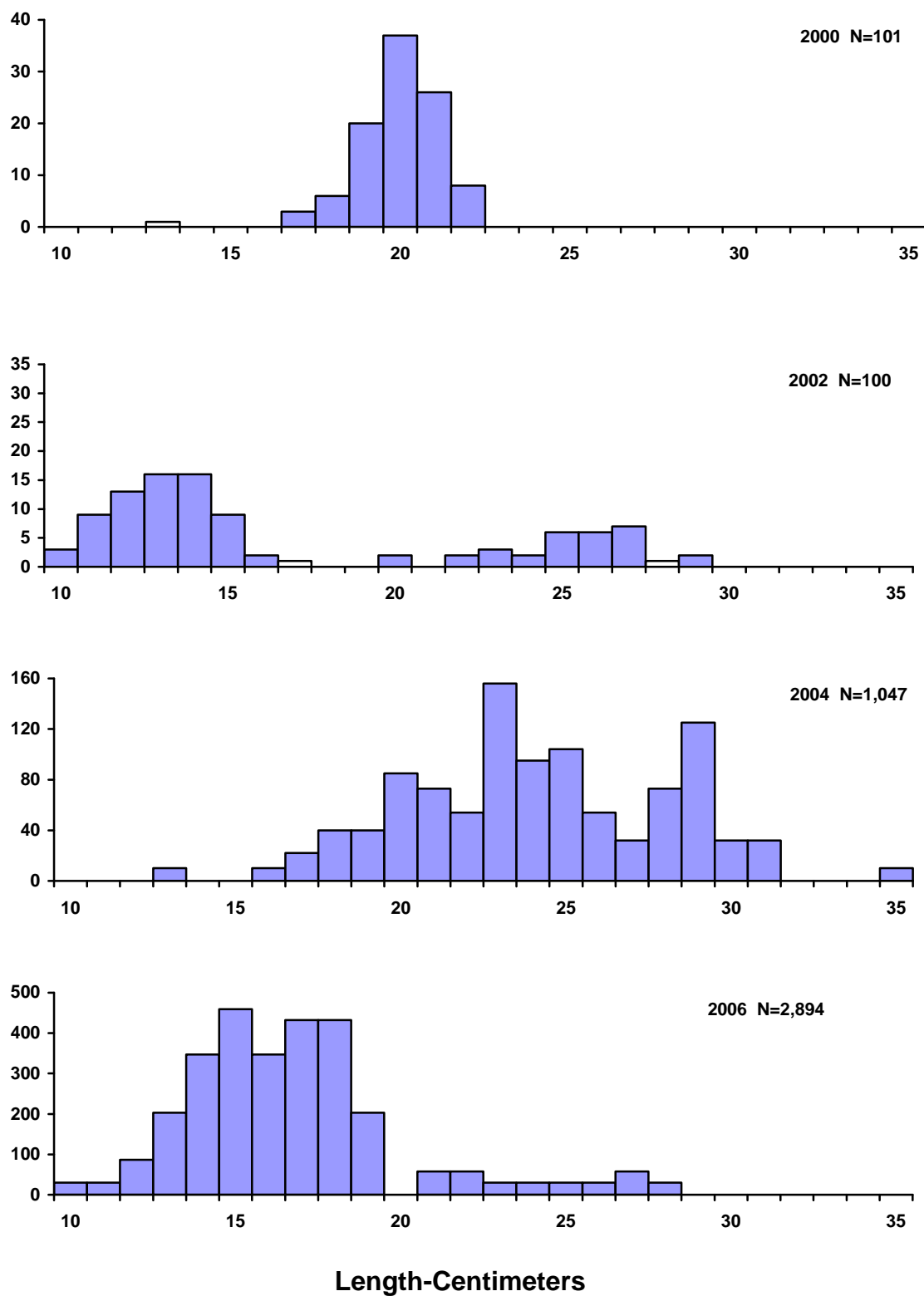


Figure 3. Length frequency histograms for black bullheads sampled with trap nets in Diamond Lake, Minnehaha County, 2000, 2002, 2004 and 2006.

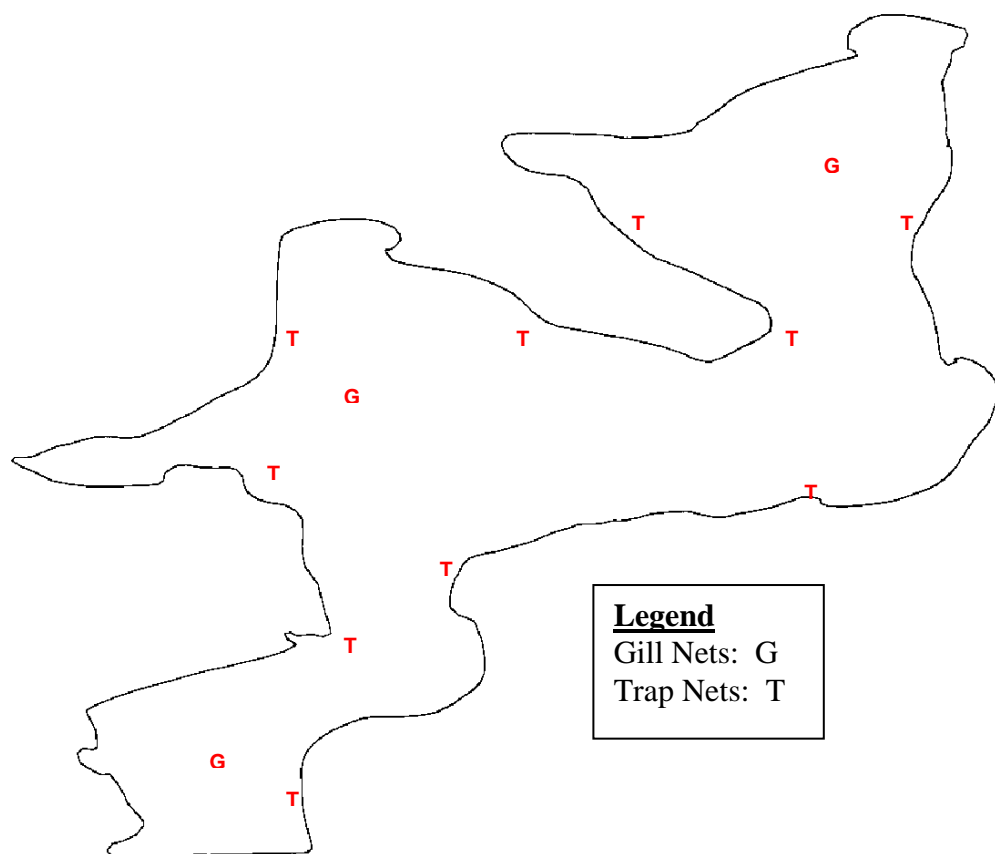


Figure 4. Sampling locations on Diamond Lake, Minnehaha County, 2006.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-39

Name: Loss Lake

County: Minnehaha

Legal Description: T101- R52-Sec. 4

Location from nearest town: ½ west, 4½ south and ½ east of Humboldt, SD.

Dates of present survey: June 21-22, 2006

Date last surveyed: June 23-24, 2004

Primary Game and Forage Species	Other Species
Black Crappie	Black Bullhead
Yellow Perch	Orange-spotted Sunfish
Channel Catfish	Green Sunfish
Walleye	Common Carp

PHYSICAL DATA

Surface Area: 86 acres

Maximum depth: 8.5 feet

Volume: Unknown

Contour map available: No

OHWM elevation: None set

Outlet elevation: None set

Lake elevation observed during the survey: Full

Beneficial use classifications: (6) warmwater marginal fish propagation, (7) immersion recreation, (8) limited-contact recreation and (9) fish and wildlife propagation and stock watering.

Watershed: 1,920 acres

Mean depth: 6.9 feet

Shoreline length: Unknown

Date mapped: NA

Date set: NA

Date set: NA

Ownership of Lake and Adjacent Lakeshore Properties

Loss Lake is not listed as a meandered lake in the State of South Dakota Listing of Meandered Lakes, but the fishery is managed by the South Dakota Department of Game, Fish, and Parks (GFP). Most of the western shoreline is owned by GFP and consists of a Lake Access Area and a Game Production Area. The remainder of the shoreline is privately owned.

Fishing Access

The Loss Lake Access Area consists of a single lane, concrete plank boat ramp and a gravel parking lot located on the southwest corner of the lake. The boat ramp is currently under water due to high water levels but boats can still be launched. A new boat ramp, dock, toilet and shoreline improvements have been planned. Shore fishing is difficult due to high banks along the shoreline.

Field Observations of Water Quality and Aquatic Vegetation

The water in Loss Lake was fairly clear with a Secchi depth measurement of 0.38 m (15 in). Sago pondweed (*Potamogeton pectinatus*) and clasping leaf pondweed (*Potamogeton richardsonii*) was abundant around much of the lake. Scattered patches of cattail (*Typha spp.*) and bulrush (*Scirpus spp.*) were present near shore.

BIOLOGICAL DATA

Methods:

Loss Lake was sampled on June 21-22, 2006 with two overnight gill net sets and five overnight trap net sets. The trap nets are constructed with 19-mm-bar-mesh ($\frac{3}{4}$ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh ($\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, and 2 in) monofilament netting. Gill net and trap net sites are displayed in Figure 4.

Results and Discussion:

Gill Net Catch

Black bullheads (88.4%), channel catfish (8.1%), yellow perch (1.9%) and common carp (1.6%) were the only species sampled in the gill nets (Table 1).

Table 1. Total catch from two overnight gill net sets at Loss Lake, Minnehaha County, June 21-22, 2006.

Species	Number	Percent	CPUE ¹	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	228	88.4	114.0	± 0.0	66.4	4	0	92
Channel Catfish	21	8.1	10.5	± 4.5	0.0	95	0	83
Yellow Perch	5	1.9	2.5	± 1.9	29.5	--	--	--
Common Carp	4	1.6	2.0	± 1.3	0.0	--	--	--

* 4 years (1998, 2000, 2002, 2004)

Trap Net Catch

Black bullheads dominated the trap net catch (90.4%). Yellow perch, black crappie, channel catfish, and green sunfish were also sampled.

¹ See Appendix A for definitions of CPUE, PSD, and mean Wr.

Table 2. Total catch from five overnight trap net sets at Loss Lake, Minnehaha County, June 21-22, 2006.

Species	Number	Percent	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	990	90.4	198.0	±13.8	835.6	4	0	82
Yellow Perch	93	8.5	18.6	±16.8	4.7	25	16	100
Black Crappie	5	0.5	1.0	±1.3	9.5	--	--	--
Channel Catfish	5	0.5	1.0	±0.6	0.0	--	--	--
Green Sunfish	2	0.2	0.4	±0.5	0.0	--	--	--

* 7 years (1988, 1989, 1996, 1998, 2000, 2002, 2004)

Yellow Perch

Management objective: Maintain a yellow perch population with a gill-net CPUE of at least 50 with a PSD range of 30-60.

Yellow perch gill-net CPUE has been decreasing since 2000 (Table 3) in spite of several stockings (Table 6). The trap nets did contain a fair number of yellow perch (CPUE=18.6), most likely stocked in 2006. There has been little natural reproduction for several years which is similar to other lakes in the region.

Table 3. Yellow perch gill-net CPUE, PSD, RSD-P, and mean Wr for Loss Lake, Minnehaha County, 1998-2006.

	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	19.5		53.0		28.0		17.5		2.5	29.5
PSD	63		40		10		13		--	32
RSD-P	37		18		4		13		--	18
Mean Wr	88		83		110		104		--	96

* 4 years (1998, 2000, 2002, 2004)

Black Crappie

Management objective: Maintain a crappie fishery with a trap-net CPUE of at least 20 and PSD of at least 40.

Adult crappies stocked after the 2000-01 winterkill have successfully reproduced, however, a strong year class has not recruited to the population (Table 4, Figure 2).

Table 4. Black crappie trap-net CPUE, PSD, RSD-P, and mean Wr for Loss Lake, Minnehaha County, 1998-2006.

	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	6.5		15.6		3.2		3.8		1.0	9.8
PSD	83		100		13		100		--	79
RSD-P	72		88		7		22		--	55
Mean Wr	114		124		128		118		--	121

*5 years (1996, 1998, 2000, 2002, 2004)

Black Bullhead

Management objective: Maintain a black bullhead population with a trap-net net CPUE of less than 100.

Black bullhead CPUE has declined and growth has increased since 2000, but CPUE is still substantially higher than our objective (Table 5) and small fish still dominate the population (Figure 3). The abundant bullhead population may be suppressing the recruitment of black crappies and yellow perch. GFP crews removed bullheads from the lake in 2003, 2004 and 2006 and recent introductions of channel catfish and walleye were made in an attempt to decrease black bullhead numbers and provide more angling opportunity.

Table 5. Black bullhead trap-net CPUE, PSD, RSD-P, and mean Wr for Loss Lake, Minnehaha County, 1998-2006.

	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE	240.8		1,112.6		546.2		243.6		198.0	505.7
PSD	0		14		3		0		4	5
RSD-P	0		0		1		0		0	0
Mean Wr	--		100		99		90		82	96

* 5 years (1996, 1998, 2000, 2002, 2004)

All Species

Northern pike and white sucker have not been sampled in Loss Lake since 2000 (Table 6). They were likely eliminated by the 2000-2001 winterkill. Adult channel catfish were introduced in 2005 and juvenile walleyes in 2006 (Table 7). Common carp were sampled for the first time since 2000.

Table 6. Gill-net (GN) and trap-net (TN) CPUE for all fish species sampled in Loss Lake, Minnehaha County, 1998-2006.

Species	1998	1999	2000	2001	2002	2003	2004	2005	2006
NOP (GN)	--		0.3		--		--		--
NOP (TN)	--		--		--		--		--
BLC (GN)	--		1.3		--		--		--
BLC (TN)	6.5		15.6		3.2		3.8		1.0
CCF (GN)	--		--		--		--		10.5
CCF (TN)	--		--		--		--		1.0
GSF (GN)	0.5		0.6		--		--		--
GSF (TN)	4.1		4.2		--		0.2		0.4
OSF (GN)	--		--		--		2.0		--
OSF (TN)	--		0.2		--		0.2		--
YEP (GN)	19.5		53.0		28.0		17.5		2.5
YEP (TN)	8.4		10.2		2.0		6.8		18.6
BLB (GN)	17.0		81.3		88.3		79.0		114.0
BLB (TN)	240.8		1,112.6		546.2		243.6		198.0
COC (GN)	1.5		10.3		--		--		2.0
COC (TN)	2.6		0.2		--		--		--
WHS (GN)	--		--		--		--		--
WHS (TN)	0.5		0.2		--		--		--

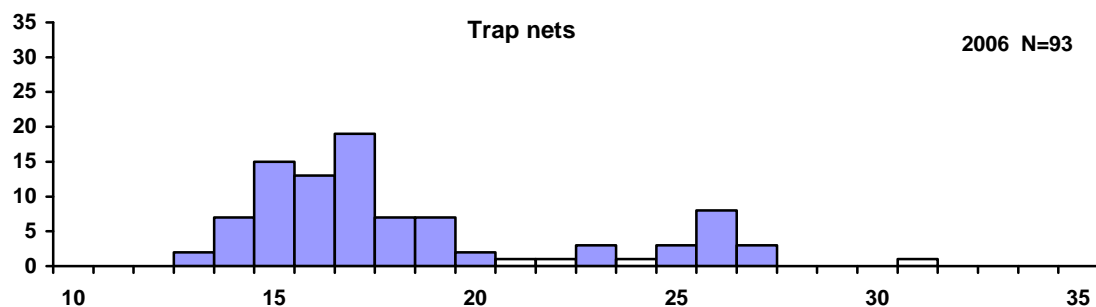
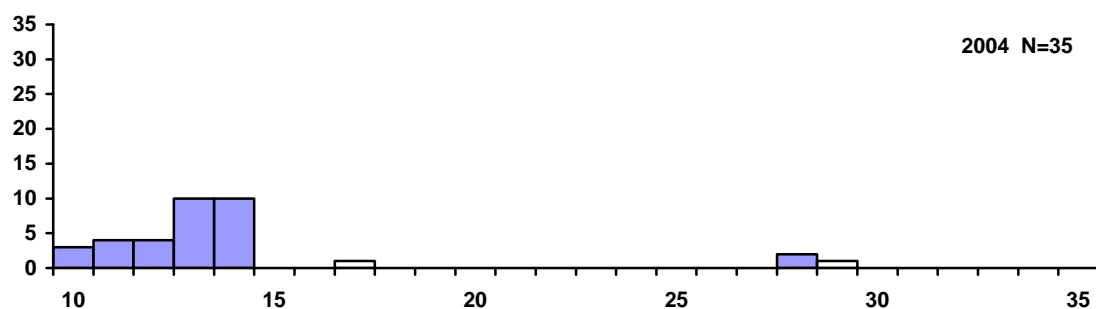
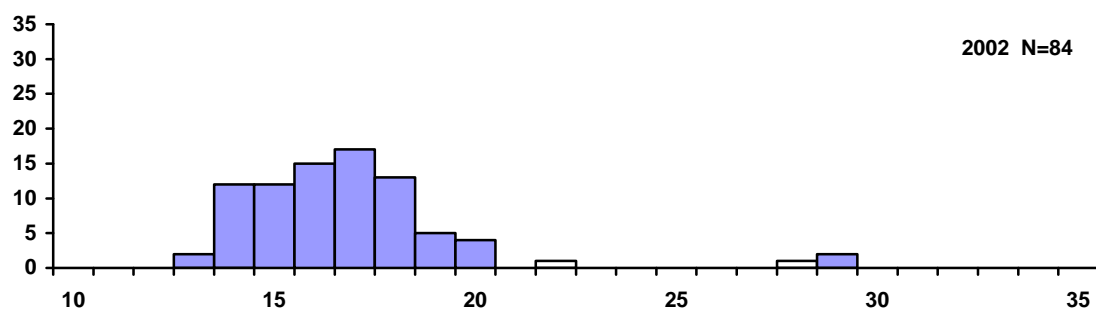
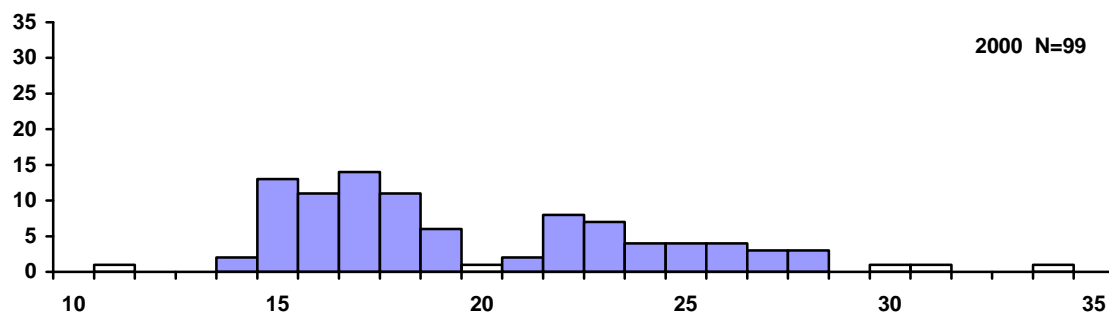
NOP (Northern Pike), BLC (Black Crappie), GSF (Green Sunfish), OSF (Orange-spotted Sunfish), YEP (Yellow Perch), BLB (Black Bullhead), COC (Common Carp), WHS (White Sucker)

MANAGEMENT RECOMMENDATIONS

1. Stock adult channel catfish and walleyes, if available, to control bullheads and provide diversified angling opportunity.
2. Stock yellow perch and black crappie adults to supplement limited natural reproduction.
3. Conduct lake surveys every other year to monitor the fishery.
4. Conduct a large-scale habitat project in 2006 consisting of the placement of inshore and offshore tree reefs, shoreline woody debris and native aquatic vegetation plantings.

Table 6. Stocking record for Loss Lake, Minnehaha County, 1990-2006.

Year	Number	Species	Size
1990	250	Northern Pike	Adult
1991	600	Yellow Perch	Adult
1993	2,038,500	Yellow Perch	Eyed Eggs
1995	837	Black Crappie	Adult
1999	825	Yellow Perch	Adult
2000	825	Yellow Perch	Adult
2001	987	Black Crappie	Adult
	840	Yellow Perch	Adult
2002	901	Yellow Perch	Adult
2003	1,548	Yellow Perch	Adult
	752	Yellow Perch	Juvenile
2005	804	Channel Catfish	Adult
	1,236	Yellow Perch	Adult
2006	260	Channel Catfish	Adult
	252	Yellow Perch	Adult
	2,055	Yellow Perch	Juvenile
	1,158	Walleye	Juvenile
	625	Walleye	Lrg. Fingerling



Length-Centimeters

Figure 1. Length frequency histograms for yellow perch sampled with gill nets in Loss Lake, Minnehaha County, 2000, 2002 and 2004. Trap net sample was used in 2006.

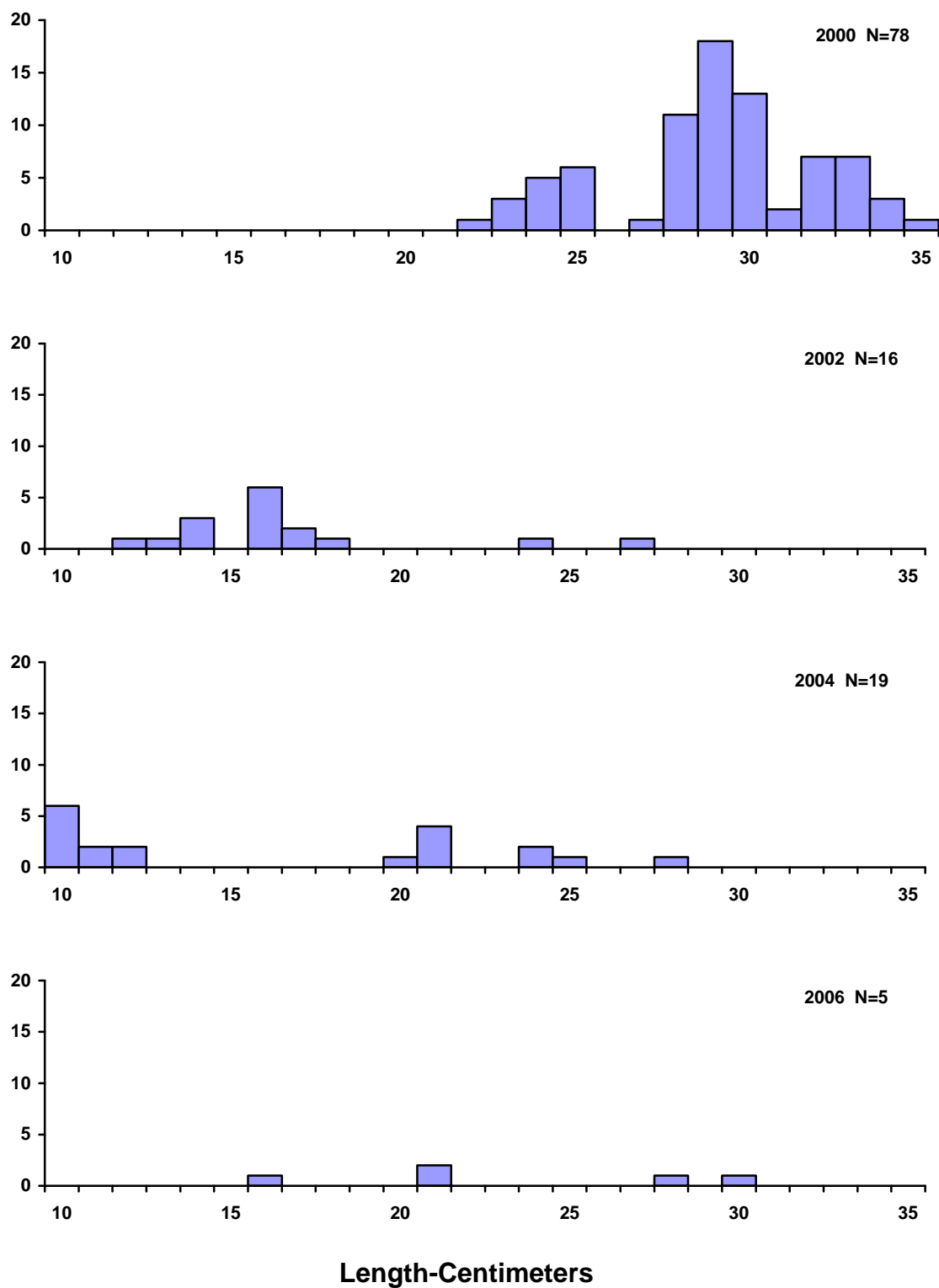


Figure 2. Length frequency histograms for black crappies sampled with trap nets in Loss Lake, Minnehaha County, 2000, 2002, 2004 and 2006.

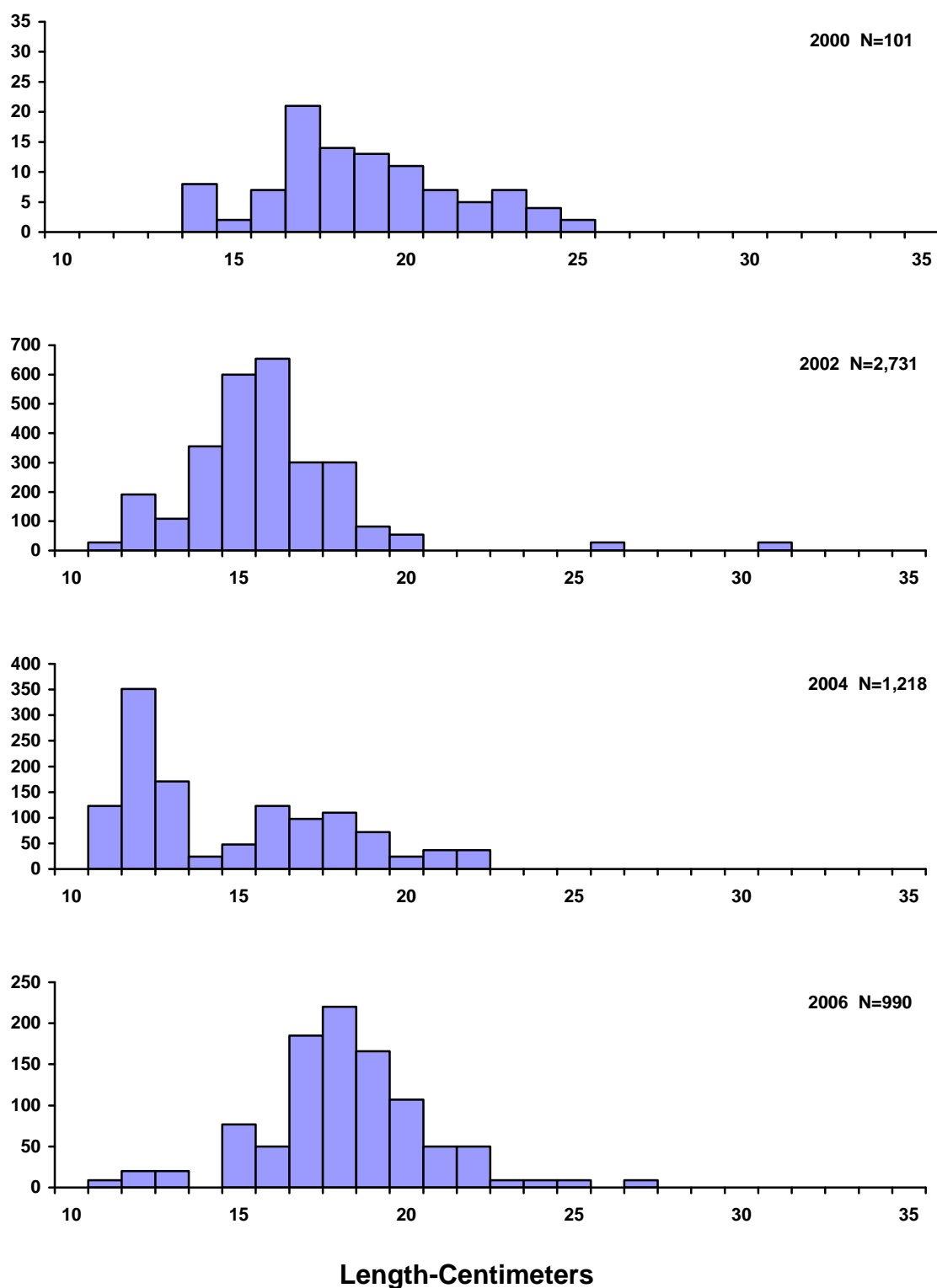


Figure 3. Length frequency histograms for black bullheads sampled with trap nets in Loss Lake, Minnehaha County, 2000, 2002, 2004 and 2006.

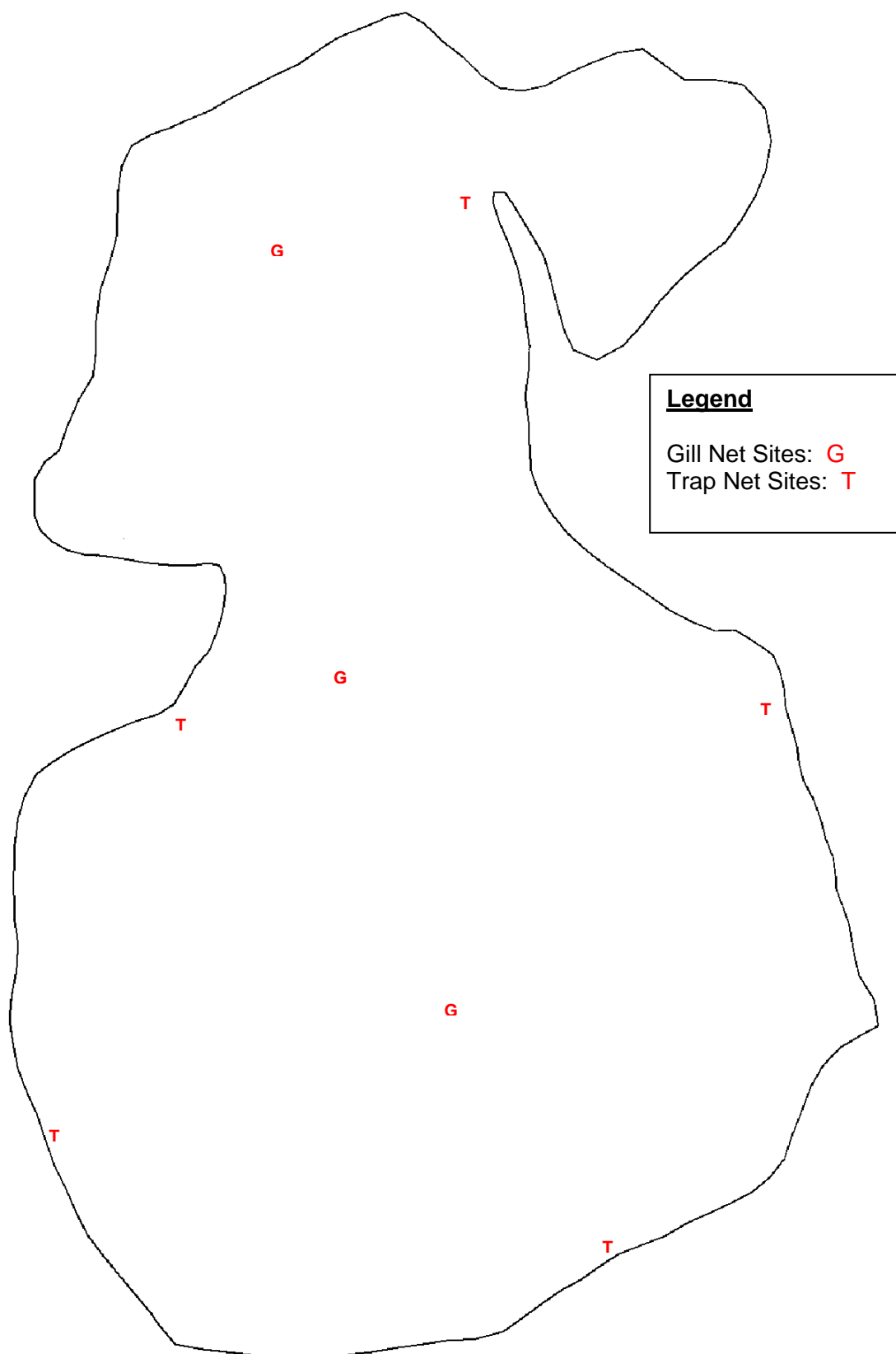


Figure 4. Sampling locations on Loss Lake, Minnehaha County, 2006.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-39

Name: Twin Lakes

County: Minnehaha

Legal Description: T105N-R52W Sec. 16-17, 20-21

Location from nearest town: 6 miles north and 1 mile west of Humboldt, SD

Dates of present survey: July 19-20, 2006 (netting), September 18, 2006 (electrofishing)

Dates of last survey: June 30, 2004-July 1, 2004

Primary Game and Forage Species	Other Species
Walleye	Black Bullhead
Yellow Perch	

PHYSICAL DATA

Surface Area: 287 acres

Watershed area: Unknown acres

Maximum depth: 20 feet

Mean depth: 9 feet

Contour map available: No only)

Date mapped: 2003 (shoreline

Lake elevation observed during the survey: 2.5 feet low

Ownership of Lake and Adjacent Lakeshore Properties

Twin Lakes is not listed as meandered public water in the State of South Dakota Listing of Meandered Lakes; however, the fishery is managed by the South Dakota Department of Game, Fish and Parks (GFP). GFP also owns and manages a 254 acre Game Production Area which includes much of the lakes. The remainder of the shoreline is privately owned.

Fishing Access:

The Twin Lakes Game Production area has shore fishing access and a place to launch small boats on the west side of the south lake. Efforts are being made to develop access to the north lake, or to deepen the channel connecting the two lakes.

Field Observations of Water Quality and Aquatic Vegetation:

The Secchi reading was 76 cm (30 in) on the north lake. The water was more turbid on the south lake with a reading of only 30 cm (12 in). Abundant beds of sago pondweed (*Potamogeton pectinatus*), clasping leaf pondweed (*Potamogeton richardsonii*), northern water milfoil (*Myriophyllum exalbescens*), water buttercup (*Ranunculus longirostris*), coontail (*Ceratophyllum demersum*), and wild celery (*Valisneria Americana*) were observed in water up to 1.82 m (6 ft) deep. Common cattail (*Typha spp.*) and bulrush (*Scirpus spp.*) were abundant in shallow areas.

BIOLOGICAL DATA

Methods:

Twin Lakes was sampled on July 19-20, 2006, with two overnight gill-net sets and 5 overnight trap-net sets on each lake. The trap nets are constructed with 19-mm-bar-mesh (3/4 in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh (½, ¾, 1, 1¼, 1½, and 2 in) monofilament netting. One hour of nighttime electrofishing was done on September 18, 2006 to evaluate walleye recruitment. Only the South Lake was sampled because access to the North Lake was not possible with the electrofishing boat. Sampling locations are displayed in Figure 2.

Results and Discussion:

Gill Net Catch

Walleye (48.6%), black bullheads (46.4%), and yellow perch (5.0%) were the only fish sampled in the gill nets this year on South Twin Lakes (Table 1). On the North Lake, black bullheads (78.9%) were the most abundant species followed by walleye (20.3%) and yellow perch (0.8%) (Table 2).

Table 1. Total catch from two overnight gill net sets at South Twin Lakes, Minnehaha County, July 19-20, 2006.

Species	Number	Percent	CPUE ¹	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Walleye	204	48.6	102.0	<u>±</u> 91.0	0.5	33	0	100
Black Bullhead	195	46.4	97.5	<u>±</u> 21.1	41.5	32	10	91
Yellow Perch	21	5.0	10.5	<u>±</u> 3.2	16.5	71	38	98

* One year (2004)

Table 2. Total catch from two overnight gill net sets at North Twin Lakes, Minnehaha County, July 19-20, 2006.

Species	Number	Percent	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	295	78.9	147.5	<u>±</u> 31.4	--	12	4	105
Walleye	76	20.3	38.0	<u>±</u> 0.0	--	52	6	93
Yellow Perch	3	0.8	1.5	<u>±</u> 1.9	--	--	--	--

*2006 is the first survey year

¹ See Appendix A for definitions of CPUE, PSD, RSD-P, and mean Wr.

Trap Net Catch

Black bullheads made up 98.8% of the trap net sample on the South Lake (Table 3). Walleye and yellow perch were the only other fish caught. On the North Lake, black bullheads made up 91.1% of the catch (Table 4). Walleye and yellow perch were also sampled.

Table 3. Total catch from five overnight trap net sets at South Twin Lakes, Minnehaha County, July 19-20, 2006.

Species	Number	Percent	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	3,258	98.8	651.6	± 241.3	250.6	19	13	98
Walleye	22	0.7	4.4	± 2.0	0.0	24	0	104
Yellow Perch	18	0.5	3.6	± 0.3	0.6	44	28	98

* One year (2004)

Table 4. Total catch from five overnight trap net sets at North Twin Lakes, Minnehaha County, July 19-20, 2006.

Species	Number	Percent	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Bullhead	1,885	91.1	377.0	± 257.5	--	3	3	128
Walleye	151	7.3	30.2	± 13.5	--	36	2	101
Yellow Perch	34	1.6	6.8	± 0.3	--	46	29	108

*2006 is the first survey year

Walleye

Management objective: Maintain a walleye population with a gill-net CPUE of at least 15, a PSD range of 30-60, and a growth rate of 14 inches by age-3.

Walleye gill-net CPUE, growth and size structure exceeded management objectives in 2006 (Tables 1, 2, and 5). Several strong year classes, produced by an aggressive stocking strategy, were present in the sample. The walleyes were in good condition with mean relative weights (Wr) between 90 and 100, which is high for midsummer. Large numbers of fathead minnows were seen in both lakes during the survey.

Table 5. Average back-calculated lengths (mm) for each age class of walleye in Twin Lakes, Minnehaha County, 2006.

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2006	0	133								
2005	1	104	157							
2004	2	34	168	356						
2003	3	9	155	303	399					
2001	5	2	127	232	388	438	475			
2000	6	3	182	337	446	487	510	533		
All Classes		285	160	340	408	467	496	533		
Statewide Mean			168	279	360	425	490			
Region III Mean			173	281	367	435	517			
LLI* Mean			169	280	358	425	494			

*Large lakes and Impoundments

There was a discrepancy between gill-net and electrofishing catches of age-0 and age-1 walleyes. Electrofishing catches of both year classes were poor while 0 and 1 year olds were both abundant in the summer gill nets. Subsequent surveys should provide a clearer picture of actual production. Age-0 walleyes were large and in excellent condition.

Table 6. Nighttime electrofishing CPUE for age-0 and age-1 walleyes in South Twin Lake, Minnehaha County, 2003-2006.

Year	Stocking	Age-0 CPH	80% C.I.	Mean length (range; mm)	Wr	Age-1 CPH	80% C.I.	Mean length (range; mm)	Wr
2006	fingerling	19	0-43	222 (204-239)	124	5	0-10	300 (290-309)	95
2005	large fg1 ¹	0				2	0-6	237 (235-238)	106
2004	large fg1 ²	0				3	0-5	307 (299-314)	100
2003	fingerling	60	8-111	145 (115-192)	90				

¹ Stocked with 7,232 large walleye fingerlings (32/lb) after electrofishing was completed

² 25 juvenile walleyes (6/lb) were stocked on May 27, 2004. Additionally, 5,606 large fingerling walleyes (17/lb.) were stocked after electrofishing was completed.

Black Bullhead

Management objective: Maintain a black bullhead population with a trap-net CPUE of 100 or less.

Black bullhead trap net CPUE currently exceeds our management objective of 100 or less. In 2003, we began a five year research study to evaluate the use of walleye predation as a biological control of black bullheads. Because small fingerling and adult stocking had not produced the desired walleye density, large fingerlings were stocked following the 2004 electrofishing survey. With plenty of fathead minnows to eat, these large fingerlings survived well and grew fast. However, the desired bullhead control has not been achieved. Most of the black bullheads are too large for the average walleye to eat (Figure 2). The abundant fathead minnows may be keeping the walleyes fed and buffering bullhead predation.

Creel Survey Results

A creel survey was conducted on Twin Lakes from May through August 2004-2006 to obtain baseline data on marginal lakes and to monitor the effect of the one walleye over 24 inches daily limit regulation. An average of 550 hours of fishing pressure was recorded (1.9 h/acre, Table 7) and all parties interviewed were South Dakota residents. The average trip length was 2.88 hours in 2004, 2.12 hours in 2005 and 1.90 hours in 2006.

Walleye catch rates jumped in 2006 to nearly 1.7 fish per hour. Anglers, fishing by boat in the North Lake, reported catching and releasing large numbers of walleyes. Shore fishing by early summer was difficult due to heavy vegetation. No walleye harvest was observed by the clerk. Observations by fisheries staff indicated that fishing pressure increased in September after the creel survey was completed. This increase was most likely due to improved shorefishing access after the vegetation died off and a good fall walleye bite.

Table 7. Estimates of fishing pressure and catch (harvest) of fish in Twin Lakes from May through August 2004-2006.

	Fishing Pressure (Hours)	Walleye Catch (Harvest)	Yellow Perch Catch (Harvest)	Black Bullhead Catch (Harvest)	Black Crappie Catch (Harvest)
2004	394	39 (0)	0 (0)	0 (0)	0 (0)
2005	657	22 (11)	0 (0)	0 (0)	0 (0)
2006	589	983 (0)	14 (0)	0 (0)	0 (0)

Table 8. Number of angler interviews and estimates of hourly catch rate (harvest rate) of fish in Twin Lakes from May through August 2004-2006.

	Number of Interviews	Walleye Catch (Harvest)	Yellow Perch Catch (Harvest)	Black Bullhead Catch (Harvest)	Black Crappie Catch (Harvest)
2004	9	0.099 (0)	0 (0)	0 (0)	0 (0)
2005	14	0.033 (0.017)	0 (0)	0 (0)	0 (0)
2006	6	1.669 (0)	0.024 (0)	0 (0)	0 (0)

MANAGEMENT RECOMMENDATIONS

1. Continue to monitor the effect of the experimental walleye regulation on the bullhead population by conducting annual lake surveys.

Table 9. Stocking record for Twin Lakes, Minnehaha County, 1995-2006.

Year	Number	Species	Size
1995	32	Walleye	Adult
1996	500	Yellow Perch	Adult
2000	1,920	Yellow Perch	Adult
2002	109	Walleye	Adult
2003	58,784	Walleye	Fingerling
2004	5,606	Walleye	Large Fingerling
	25	Walleye	Juvenile
2005	19,616	Walleye	Large Fingerling
2006	31,030	Walleye	Fingerling
	5,372	Yellow Perch	Adult

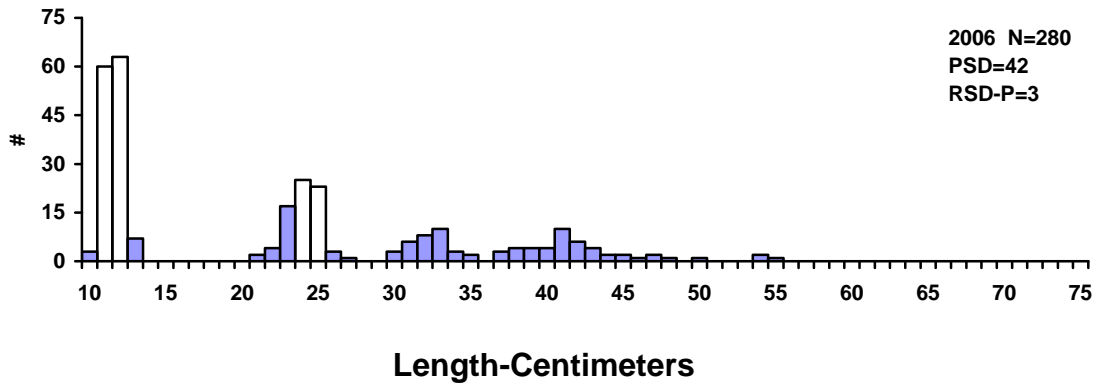


Figure 1. Length frequency histograms for walleye sampled with gill nets in Twin Lakes, Minnehaha County, 2006.

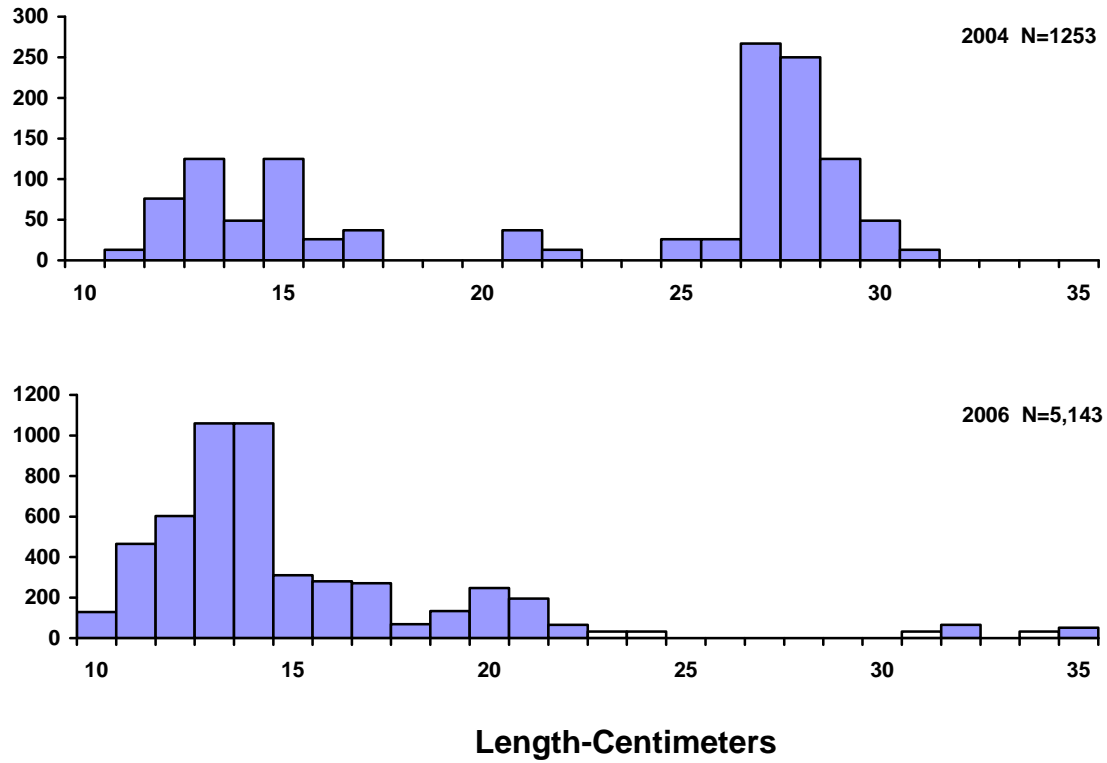


Figure 2. Length frequency histograms for black bullheads sampled with trap nets in Twin Lakes, Minnehaha County, 2004, and 2006.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-39

Name: Wall Lake

County: Minnehaha

Legal Description: T101N-R51W-Sec. 21 & 28

Location from nearest town: 6 miles south and 1/2 mile west of Hartford, SD

Dates of present survey: June 26-28, 2006

Date last surveyed: June 28-30, 2004

Primary Game and Forage Species	Other Species
Walleye	Black Bullhead
Black Crappie	Northern Pike
Yellow Perch	White Sucker
Channel Catfish	Common Carp
	Pumpkinseed
	Bluegill
	Bigmouth Buffalo

PHYSICAL DATA

Surface Area: 207 acres

Maximum depth: 24 feet

Volume: 1,785 acre-feet

Contour map available: Yes

OHWM elevation: 1559.5

Outlet elevation: 1559.0

Lake elevation observed during the survey: Full

Beneficial use classifications: (5) warmwater semi-permanent fish life propagation, (7) immersion recreation, (8) limited-contact recreation and (9) wildlife propagation and stock watering.

Watershed area: 1,118 acres

Mean depth: 11.5 feet

Shoreline length: 2.5 miles

Date mapped: 1994

Date set: April, 1983

Date set: April, 1983

Ownership of lake and adjacent lakeshore properties:

Wall Lake is listed as meandered public water in the State of South Dakota Listing of Meandered Lakes and the South Dakota Department of Game, Fish and Parks (GFP) manages the fishery. The entire shoreline is privately owned with the exception of the Wall Lake Access Area on the southwest corner of the lake and a public swimming beach managed by Minnehaha County on the south shore.

Fishing Access:

The Wall Lake Access Area has a double lane boat ramp, dock, public toilet and excellent shore fishing access. A handicapped-accessible fishing dock was recently installed.

Field Observations of Water Quality and Aquatic Vegetation:

Although dense algae blooms reduced water clarity in some areas of the lake, the Secchi depth measurement was 1.17 m (46 in) where measured this year. A few stands of common cattail (*Typha spp.*) were found around the shoreline.

BIOLOGICAL DATA

Methods:

Wall Lake was sampled on June 26-28, 2006 with two overnight gill net sets and nine overnight trap net sets. The trap nets are constructed with 19-mm-bar-mesh ($\frac{3}{4}$ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh ($\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, and 2 in) monofilament netting. Sampling locations are displayed in Figure 5.

Results and Discussion:

Gill Net Catch

Black crappie, walleye and yellow perch comprised 70.2% of the gill net sample (Table 1). Nine additional species were also sampled.

Table 1. Total catch from two overnight gill net sets at Wall Lake, Minnehaha County, June 26-28, 2006.

Species	Number	Percent	CPUE ¹	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Crappie	136	38.2	68.0	± 14.1	1.8	3	0	97
Walleye	67	18.8	33.5	± 12.2	11.0	61	2	93
Yellow Perch	47	13.2	23.5	± 8.3	22.8	79	49	89
Black Bullhead	30	8.4	15.0	± 1.3	83.0	100	40	91
Channel Catfish	24	6.7	12.0	± 2.6	2.5	88	4	99
Pumpkinseed	16	4.5	8.0	± 10.3	0.3	0	0	103
O. S. Sunfish	12	3.4	6.0	± 4.2	0.1	--	--	--
Bluegill	12	3.4	6.0	± 0.0	2.5	0	0	136
Common Carp	5	1.4	2.5	± 0.5	1.6	--	--	--
Bigmouth buffalo	4	1.1	2.0	± 0.0	0.0	--	--	--
Largemouth Bass	2	0.6	1.0	± 0.0	0.0	--	--	--
White Sucker	1	0.3	0.5	± 0.6	2.3	--	--	--

* 7 years (1994-1996, 1998, 2000, 2002, 2004)

¹ See Appendix A for definitions of CPUE, PSD, RSD-P, and mean Wr.

Trap Net Catch

Black crappies (42.5%), bluegill (16.6%), and black bullhead (14.5%) were the most abundant species sampled in trap nets (Table 2). Ten other species made up the rest of the catch.

Table 2. Total catch from nine overnight trap net sets at Wall Lake, Minnehaha County, June 26-28, 2006.

Species	Number	Percent	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Crappie	1,203	42.5	133.7	+40.5	9.2	13	0	125
Bluegill	469	16.6	52.1	+20.9	0.1	1	1	131
Black Bullhead	409	14.5	45.4	+14.2	333.3	99	27	98
Pumpkinseed	329	11.6	36.6	+9.5	0.3	3	1	130
Common Carp	307	10.9	34.1	+41.6	0.2	0	0	92
Yellow Perch	53	1.9	5.9	+2.0	2.9	42	23	114
Bigmouth Buffalo	32	1.1	3.6	+4.2	0.1	--	--	--
Channel Catfish	14	0.5	1.6	+1.0	0.8	--	--	--
Green Sunfish	5	0.2	0.6	+0.3	0.9	--	--	--
Walleye	3	0.1	0.3	+0.3	0.7	--	--	--
White Sucker	3	0.1	0.3	+0.2	0.6	--	--	--
O. S. Sunfish	1	0.0	0.1	+0.1	0.3	--	--	--
Yellow Bullhead	1	0.0	0.1	+0.1	0.0	--	--	--

* 8 years (1988, 1994-1996, 1998, 2000, 2002, 2004)

Walleye

Management objective: Maintain a walleye population with a gill-net CPUE of at least 15, a PSD range of 30-60, and a growth rate of 14 inches by age-3.

The walleye population meets the management objectives for abundance and size structure (Table 3). However, growth is slow with many fish not reaching 356 mm (14 inches) until after age-4 (Table 4). Walleyes of various sizes have been stocked with varying success. Although, six separate year classes were sampled in 2006 (Table 4), most do not correlate well with a stocked year.

Table 3. Walleye gill-net CPUE, PSD, RSD-P, and mean Wr for Wall Lake, Minnehaha County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CPUE		14.3		12.0		6.7		7.0		33.5
PSD		31		94		65		0		61
RSD-P		0		18		16		0		2
Mean Wr		90		95		94		83		93

Table 4. Average back-calculated lengths (mm) for each age class of walleye in Wall Lake, Minnehaha County, 2006.

			Back-calculation Age							
Year Class	Age	N	1	2	3	4	5	6	7	8
2005	1	21	128							
2004	2	3	169	290						
2003	3	15	152	245	338					
2002	4	23	160	244	312	364				
2001	5	2	146	218	280	338	386			
2000	6	3	162	244	292	335	378	418		
All Classes		67	153	248	305	346	382	418		
Statewide Mean			168	279	360	425	490			
Region III Mean			173	281	367	435	517			
LLI* Mean			169	280	358	425	494			

*Large Lakes and Impoundments (>150 acres)

Black Crappie

Management objective: Provide a put-and-take fishery by annually stocking at least 50 adults/acre (10,350) when available.

Black crappie trap-net CPUE increased this year (Table 5). A total of 3,568 adult black crappies (17/acre) ranging from 18-20 cm (7-8 inches) in length were stocked prior to the 2006 survey (Table 13). However, it was evident that stocked fish comprised only a small portion of the trap net sample (Figure 2) since most of the fish sampled were less than 15 cm (6 inches) long. Very few black crappies were sampled in 2004 so most fish in the 2006 catch were probably age-2 or younger. Black crappie relative weight is very high at 125 (Table 5).

Table 5. Black crappie trap-net CPUE, PSD, RSD-P, and mean Wr for Wall Lake, Minnehaha County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CPUE		11.0		31.3		1.1		4.9		133.7
PSD		13		17		--		8		13
RSD-P		3		0		--		0		0
Mean Wr		136		113		--		109		125

Yellow Perch

Management objective: Provide a put-and-take fishery by annually stocking at least 50 adults/acre (10,350) when available.

Yellow perch gill-net CPUE decreased in 2006 (Table 6). The perch sampled ranged in length from 13-31 cm (5-12 inches) (Figure 3), had high PSD and RSD-P values, but low relative weights (Table 6). Adult yellow perch have been stocked in 3 of the past 5 years (Table 9), however, differences in the age of fish in the sample and stocked fish suggests that some natural reproduction is occurring. Although it appears growth is faster than statewide, regional and large lakes means (Table 7), many of these fish were reared in other waters, then stocked in Wall. This makes meaningful growth analysis impossible.

Table 6. Yellow perch gill-net CPUE, PSD, RSD-P, and mean Wr for Wall Lake, Minnehaha County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CPUE		14.3		48.0		31.0		47.5		23.5
PSD		23		72		27		88		79
RSD-P		14		1		1		9		49
Mean Wr		102		103		105		101		89

Table 7. Average back-calculated lengths (mm) for each age class of yellow perch in Wall Lake, Minnehaha County, 2006.

			Back-calculation Age							
Year Class	Age	N	1	2	3	4	5	6	7	8
2005	1	10	111							
2004	2	2	96	205						
2003	3	9	101	204	240					
2002	4	11	107	192	220	236				
2001	5	11	111	215	251	272	289			
2000	6	3	99	190	241	267	282	295		
1999	7	1	103	187	233	264	270	280	288	
All Classes		47	104	199	237	260	281	288	288	
Statewide Mean			86	145	190	220				
Region III Mean			94	159	208	242				
LLI* Mean			86	146	192	225				

*Large Lakes and Impoundments (>150 acres)

Black Bullhead

Management objective: Maintain a black bullhead population with a trap-net CPUE of 100 or less, and a PSD of 30-60.

The black bullhead population in Wall Lake is currently meeting our management objective (Table 8 and Figure 4). The large bullheads should provide a quality fishery for anglers and commercial fishermen.

Table 8. Black bullhead trap-net CPUE, PSD, RSD-P, and mean Wr for Wall Lake, Minnehaha County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CPUE		997.4		171.9		147.8		182.2		45.4
PSD		22		96		83		99		99
RSD-P		0		1		9		6		27
Mean Wr		106		100		100		101		98

All Species

CPUE for common carp, bigmouth buffalo, channel catfish, black crappie, bluegill, and pumpkinseed was unusually high in 2006 (Table 8). Largemouth bass were sampled for the first time in 2006. Black bullhead CPUE was much lower than average.

The CPUE of other fish species have remained relatively stable. Wall Lake has the most diverse fish community in Region III with seventeen species represented in surveys done over the past ten years.

Table 9. Gill-net (GN) and trap-net (TN) CPUE for all fish species sampled in Wall Lake, Minnehaha County, 1997-2006.

Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CCF (GN)		1.0		4.0		8.0		4.0		12.0
CCF (TN)		0.2		0.1		5.1		0.4		1.6
NOP (GN)		0.7		0.7		--		1.0		--
NOP (TN)		--		0.1		0.3		0.1		--
WAE (GN)		14.3		12.0		6.7		7.0		33.5
WAE (TN)		0.4		0.1		0.3		0.3		0.3
LMB (GN)		--		--		--		--		1.0
LMB (TN)		--		--		--		--		--
BLC (GN)		6.7		3.3		--		1.0		68.0
BLC (TN)		11.0		31.3		1.1		4.9		133.7
BLG (GN)		--		--		--		--		6.0
BLG (TN)		--		0.1		0.3		0.5		52.1
GSF (GN)		--		--		--		--		--
GSF (TN)		0.1		0.3		0.7		0.1		0.6
HYB (GN)		--		--		--		--		--
HYB (TN)		--		2.6		1.6		--		--
PKS (GN)		--		0.3		--		1.5		8.0
PKS (TN)		0.3		--		--		1.3		36.6
OSF (GN)		0.7		--		--		--		6.0
OSF (TN)		0.1		--		--		--		0.1
WHC (GN)		--		--		--		--		--
WHC (TN)		--		--		0.1		--		--
YEP (GN)		14.3		48.0		31.0		47.5		23.5
YEP (TN)		1.4		1.2		10.2		1.1		5.9
BLB (GN)		67.8		115.7		89.0		98.5		15.0
BLB (TN)		997.4		171.9		147.8		182.2		45.4
YEB (GN)		--		--		--		--		--
YEB (TN)		--		1.4		--		--		0.1
BIB (GN)		--		--		--		--		2.0
BIB (TN)		0.1		0.2		0.2		0.4		3.6
COC (GN)		0.7		0.3		--		--		2.5
COC (TN)		---		0.9		--		--		34.1
WHS (GN)		0.7		5.7		5.7		2.0		0.5
WHS (TN)		--		0.3		0.1		0.2		0.3

CCF (Channel Catfish), NOP (Northern Pike), WAE (Walleye), LMB (Largemouth Bass), BLC (Black Crappie), BLG (Bluegill), GSF (Green Sunfish), HYB (Hybrid Sunfish), PSF (Pumpkinseed Sunfish), OSF (Orange-spotted Sunfish), WHC (White Crappie), YEP (Yellow Perch), BLB (Black Bullhead), YEB (Yellow Bullhead), BIB (Bigmouth Buffalo), COC (Common Carp), WHS (White Sucker)

MANAGEMENT RECOMMENDATIONS

1. Continue to stock 100 walleye fingerlings per acre (20,700) every other year with the next one occurring in 2007. Fall electrofishing surveys that coincide with biennial lake surveys should be used to monitor walleye stocking success and natural reproduction.
2. When available, stock 10,350 adult black crappies annually to maintain a high-density, put-and-take fishery.
3. When available stock 10,350 adult yellow perch annually to maintain a high-density, put-and-take fishery.
4. Encourage commercial fishing or conduct removal projects whenever black bullhead trap-net CPUE exceeds 100 and small fish dominate the population.
5. Monitor the Wall Lake fishery with biennial netting and electrofishing surveys.

Table 10. Stocking record for Wall Lake, Minnehaha County, 1990-2006.

Year	Number	Species	Size
1990	11,000	Saugeye	Sml. Fingerling
1991	200,000	Saugeye	Fry
1993	956	Black Crappie	Adult
	25,000	Fathead Minnow	Adult
	22,200	Walleye	Sml. Fingerling
	2,425	Yellow Perch	Fingerling
1994	9,080	Yellow Perch	Fingerling
	1,985	Yellow Perch	Adult
1995	10,350	Channel Catfish	Fingerling
	2,071	Black Crappie	Adult
	4,329	Black Crappie	Fingerling
	238,500	Fathead Minnow	Adult
	20,700	Walleye	Sml. Fingerling
	2,085	Yellow Perch	Adult
1996	2,069	Black Crappie	Adult
	5,000	Walleye	Sml. Fingerling
	14,580	Yellow Perch	Fingerling
1997	2,220	Black Crappie	Adult
1999	20,700	Walleye	Fingerling
	2,100	Yellow Perch	Adult
	2,093	Yellow Perch	Juvenile
2000	545	Black Crappie	Adult
	24	Channel Catfish	Adult
	23	Walleye	Adult
	3,482	Yellow Perch	Adult
2001	1,659	Black Crappie	Adult
	21,120	Walleye	Fingerling
	2,245	Yellow Perch	Adult
2002	9,230	Yellow Perch	Adult
2003	22,414	Walleye	Fingerling
2004	667	Yellow Perch	Adult
	4,827	Black Crappie	Adult
	383	Walleye	Adult
2005	359	Channel Catfish	Adult
	1,034	Yellow Perch	Adult
	7,680	Walleye	Fingerling
2006	3,568	Black Crappie	Adult
	400	Channel Catfish	Adult
	26	Bluegill	Adult

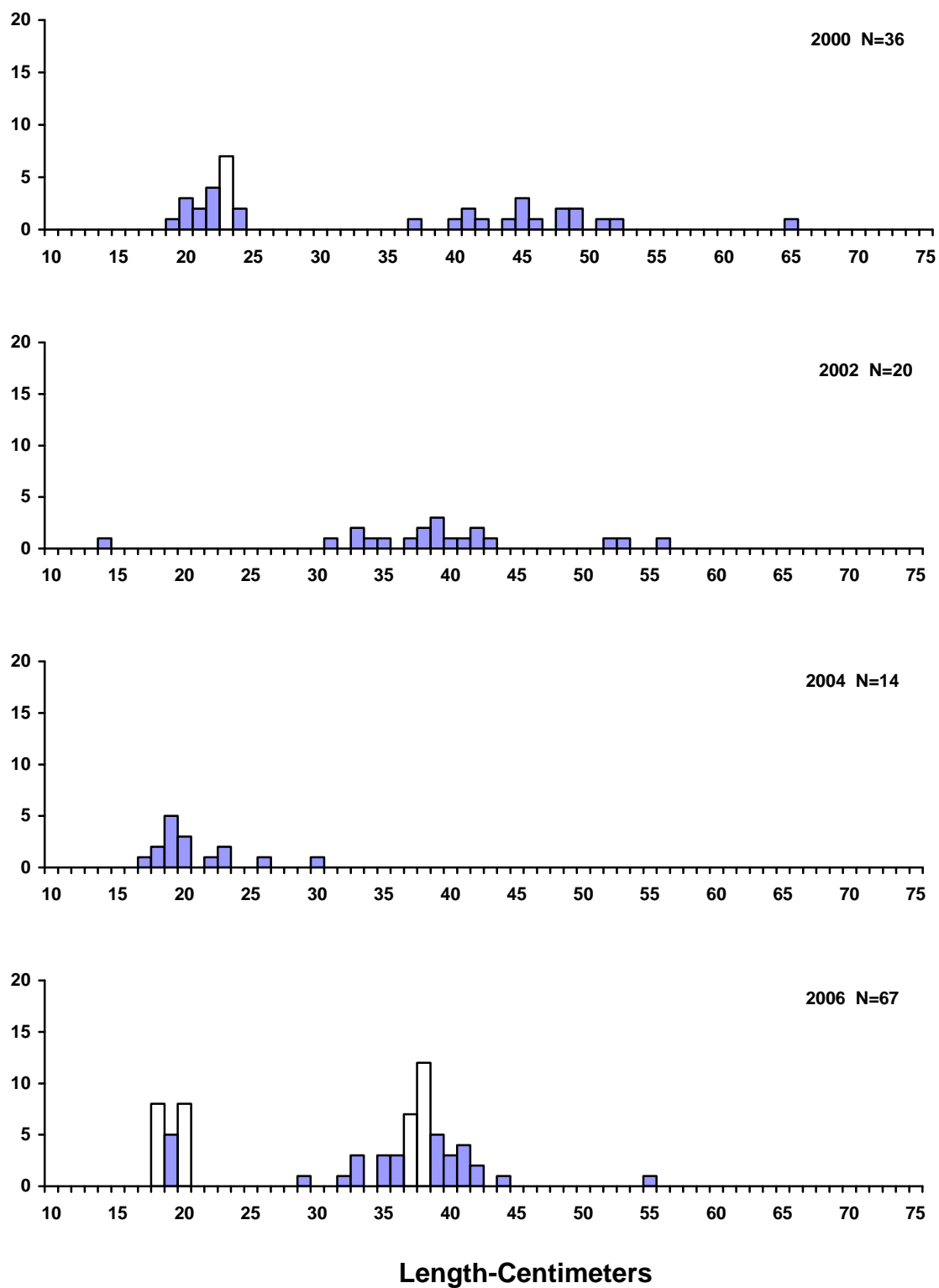


Figure 1. Length frequency histograms for walleye sampled with gill nets in Wall Lake, Minnehaha County, 2000, 2002, 2004, and 2006.

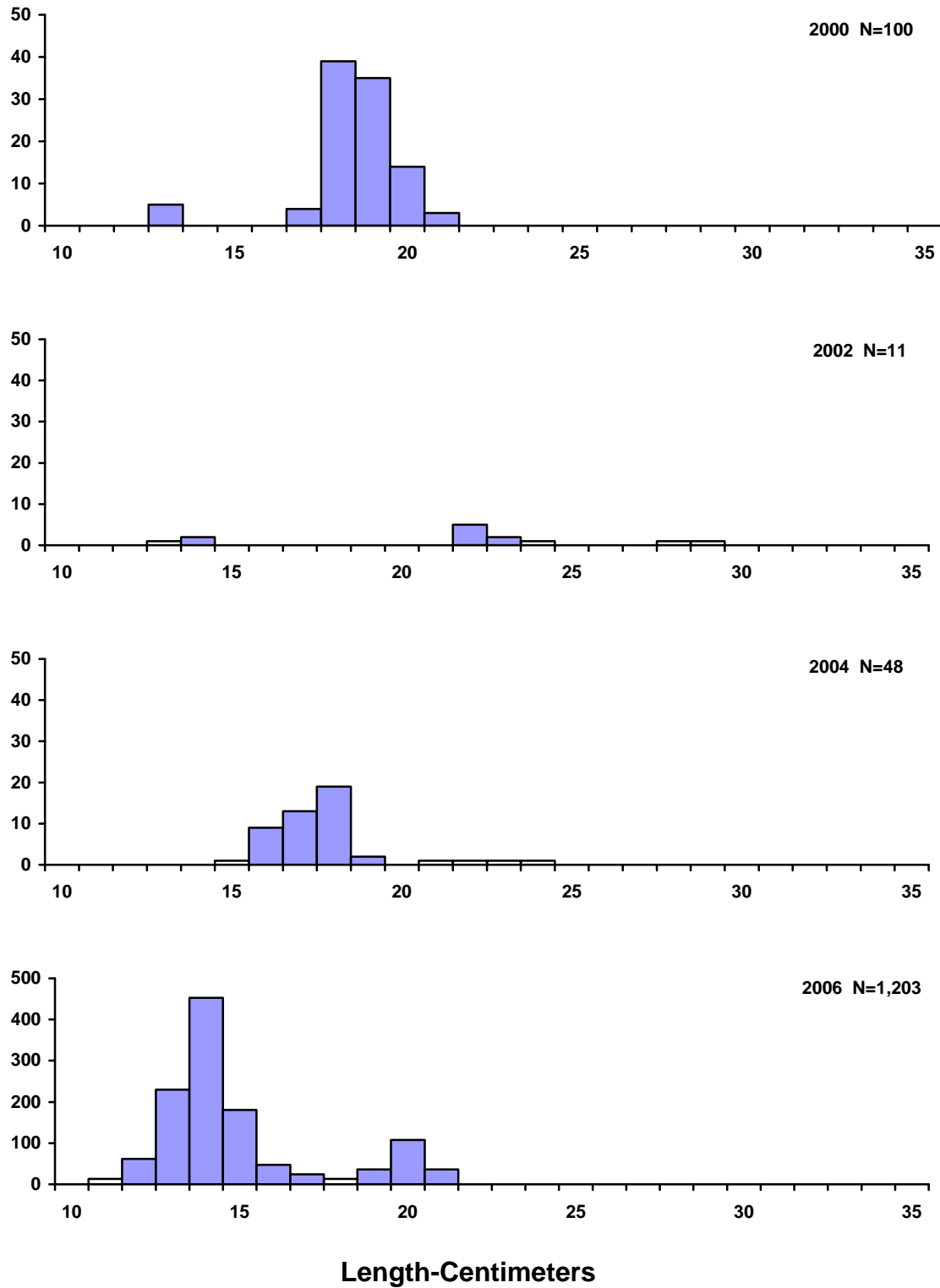


Figure 2. Length frequency histograms for black crappies sampled with trap nets in Wall Lake, Minnehaha County, 2000, 2002, 2004, and 2006.

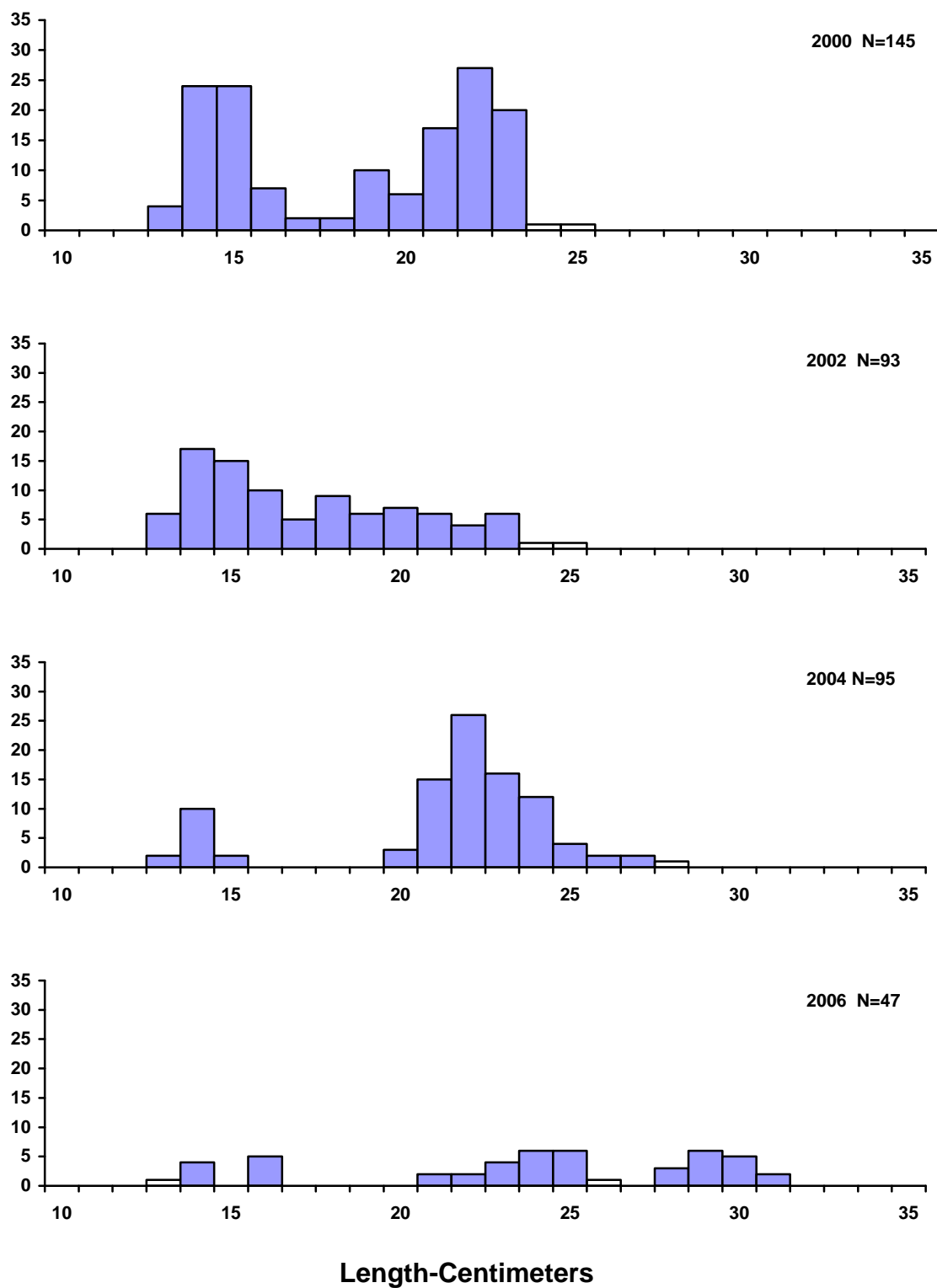


Figure 3. Length frequency histograms for yellow perch sampled with gill nets in Wall Lake, Minnehaha County, 2000, 2002, 2004, and 2006.

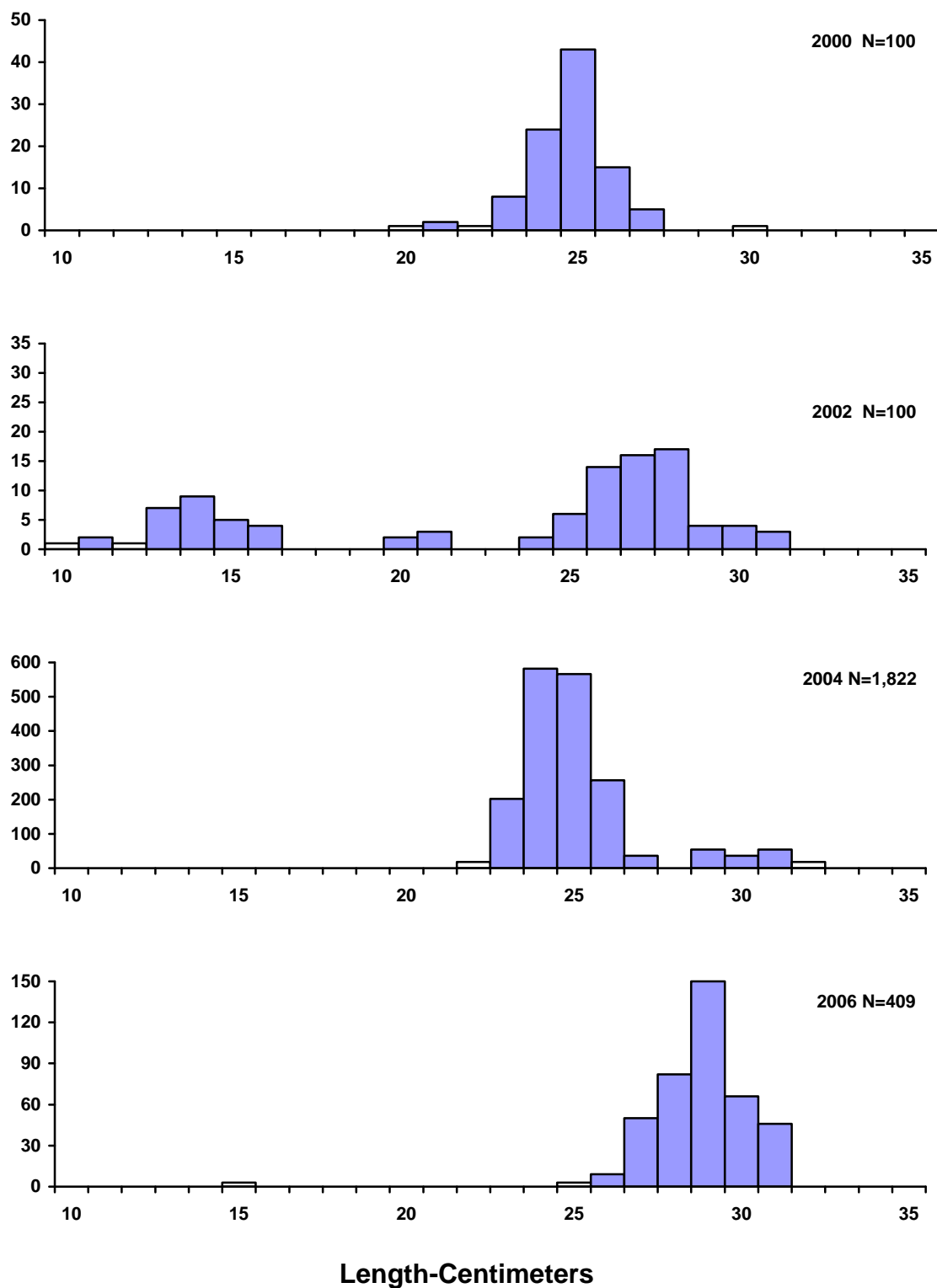
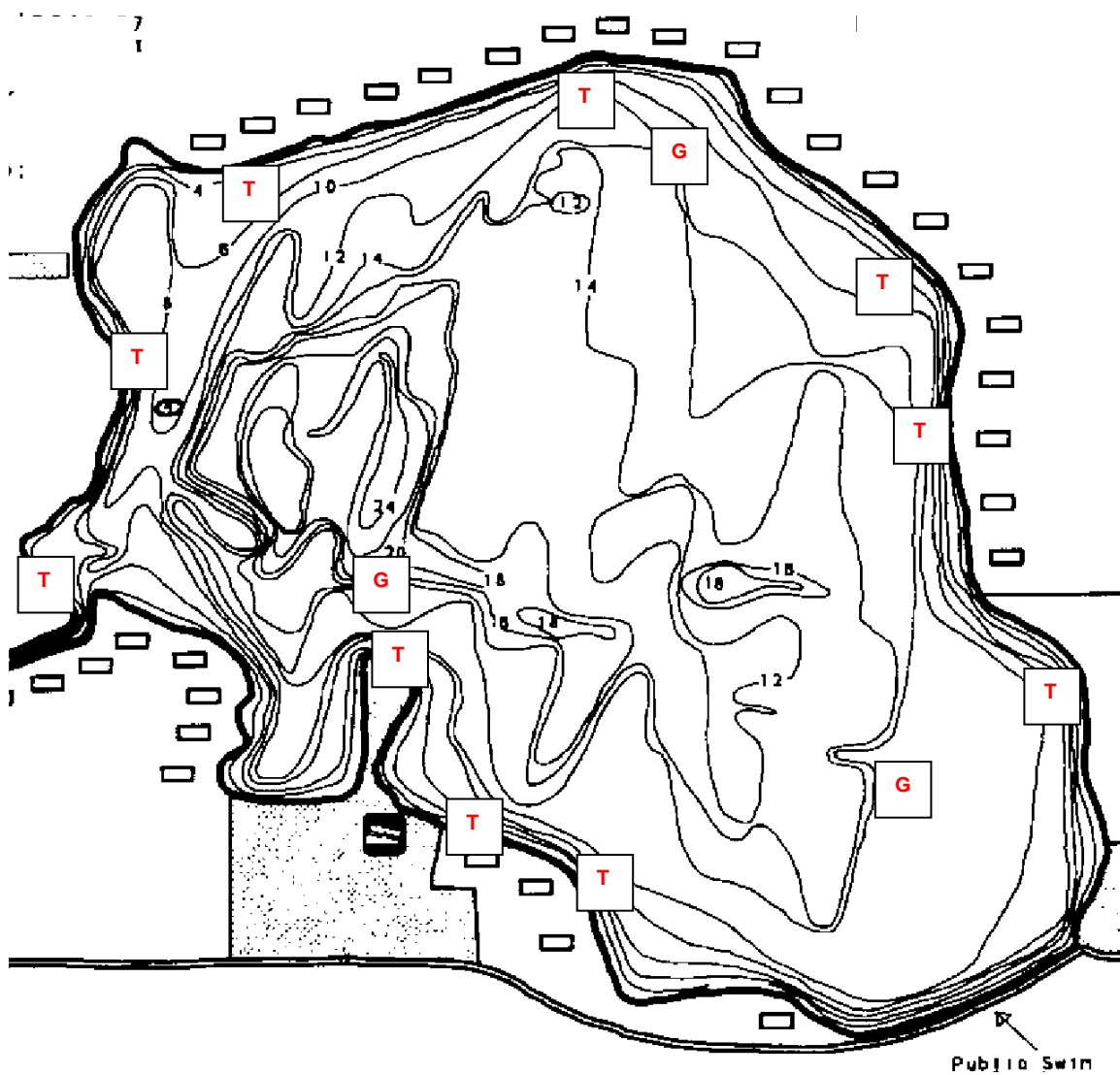


Figure 4. Length frequency histograms for black bullhead sampled with trap nets in Wall Lake, Minnehaha County, 2000, 2002, 2004, and 2006.



Legend
 Gill Nets: G
 Trap Nets: T

Figure 5. Sampling locations on Wall Lake, Minnehaha County, 2006.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.

SOUTH DAKOTA STATEWIDE FISHERIES SURVEY

2102-F-21-R-39

Name: Twin Lakes

County: Sanborn

Legal Description: T106N-R62W-Sec.30-31; T106-R63-Sec. 24-25

Location from nearest town: 6 miles south and 3 miles west of Woonsocket, SD

Dates of present survey: July 11-13, 2006

Dates of last survey: July 11-13, 2004

Primary Game and Forage Species	Other Species
Walleye	Black Bullhead
Black Crappie	Largemouth Bass
Yellow Perch	Northern Pike
	White Sucker
	Bluegill
	Smallmouth Bass
	Bigmouth Buffalo
	Common Carp
	White Crappie
	Hybrid Sunfish

PHYSICAL DATA

Surface Area: 252 acres

Maximum depth: 12.5 feet

Volume: 1,512 acre-feet

Contour map available: Yes

OHWM elevation: None set

Outlet elevation: None set

Lake elevation observed during the survey: 2 feet low

Beneficial use classifications: (5) warmwater semipermanent fish life propagation, (7) immersion recreation, (8) limited-contact recreation and (9) wildlife propagation and stock watering.

Watershed: 1,118 acres

Mean depth: 6 feet

Shoreline length: 13.1 miles

Date mapped: 1990

Date set: NA

Date set: NA

Ownership of Lake and Adjacent Lakeshore Properties

Twin Lakes is not listed as a meandered public water in the State of South Dakota Listing of Meandered Lakes, however, the fishery is managed by the South Dakota Department of Game, Fish and Parks (GFP). GFP also owns and manages a 50-acre Lake Access Area on the west side of the lake. The remainder of the shoreline is privately owned.

Fishing Access

The Twin Lakes Recreation Area, located on the west shore, contains a double lane boat ramp, dock, picnic area, primitive campground, public toilet and shore fishing access.

Field Observations of Water Quality and Aquatic Vegetation:

Dense algae blooms reduced water clarity during this year's survey (Secchi depth 27 cm (10.5 in)). A few small beds of sago pondweed (*Potamogeton pectinatus*) were observed in shallow water while common cattail (*Typha spp.*) and bulrush (*Scirpus spp.*) was abundant around much of the shore.

BIOLOGICAL DATA

Methods:

Twin Lakes was sampled on July 11-13, 2006 with three overnight gill net sets and ten overnight trap net sets. The trap nets are constructed with 19-mm-bar-mesh ($\frac{3}{4}$ in) netting, 0.9 m high x 1.5 m wide (3 ft high x 5 ft wide) frames and 18.3 m (60 ft) long leads. The gill nets are 45.7 m long x 1.8 m deep (150 ft long x 6 ft deep) with one 7.6 m (25 ft) panel each of 13, 19, 25, 32, 38 and 51-mm-bar-mesh ($\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{4}$, $1\frac{1}{2}$, and 2 in) monofilament netting. Sampling locations are displayed in Figure 4.

Results and Discussion:

Gill Net Catch

Bigmouth buffalo (47.6%), common carp (14.3%), and walleye (11.9%) were the most abundant species sampled in the gill nets (Table 1). A few black crappie, black bullhead, yellow perch, and white sucker were also sampled.

Table 1. Total catch from three overnight gill net sets at Twin Lakes, Sanborn County, July 11-13, 2006.

Species	Number	Percent	CPUE ¹	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Bigmouth Buffalo	20	47.6	6.7	± 3.6	5.1	20	0	96
Common Carp	6	14.3	2.0	± 1.5	2.2	--	--	--
Walleye	5	11.9	1.7	± 0.4	7.3	--	--	--
Black Crappie	4	9.5	1.3	± 1.1	0.3	--	--	--
Black Bullhead	4	9.5	1.3	± 1.1	40.7	--	--	--
Yellow Perch	2	4.8	0.7	± 0.9	4.6	--	--	--
White Sucker	1	2.4	0.3	± 0.4	1.4	--	--	--

* 7 years (1992, 1994, 1996, 1998, 2000, 2002, 2004)

¹ See Appendix A for definitions of CPUE, PSD, RSD-P, and mean Wr.

Trap Net Catch

Black crappies (65.0%), bluegill (17.9%), and walleye (7.6%), were the most abundant species in the trap net sample (Table 2). Other species sampled included green sunfish, black bullhead, common carp, white sucker, bigmouth buffalo, hybrid sunfish, northern pike, shortnose gar, yellow perch, white crappie, and orange-spotted sunfish.

Table 2. Total catch from ten overnight trap net sets at Twin Lakes, Sanborn County, July 11-13, 2006.

Species	Number	Percent	CPUE	80% C.I.	Mean CPUE*	PSD	RSD-P	Mean Wr
Black Crappie	367	65.0	36.7	± 10.3	7.1	21	2	94
Bluegill	101	17.9	10.1	± 5.8	0.6	10	3	92
Walleye	43	7.6	4.3	± 0.8	1.1	95	5	79
Green Sunfish	12	2.1	1.2	± 0.7	0.1	0	0	101
Black Bullhead	11	1.9	1.1	± 0.6	729.3	--	--	--
Common Carp	8	1.4	0.8	± 0.3	0.9	--	--	--
White Sucker	4	0.7	0.4	± 0.3	1.4	--	--	--
Bigmouth Buffalo	4	0.7	0.4	± 0.3	0.4	--	--	--
Hybrid Sunfish	4	0.7	0.4	± 0.4	0.1	--	--	--
Northern Pike	3	0.5	0.3	± 0.4	1.4	--	--	--
Shortnose Gar	3	0.5	0.3	± 0.4	0.0	--	--	--
Yellow Perch	2	0.4	0.2	± 0.2	5.1	--	--	--
White Crappie	2	0.4	0.2	± 0.2	0.4	--	--	--
O. S. Sunfish	1	0.2	0.1	± 0.1	0.0	--	--	--

* 9 years (1990-1992, 1994, 1996, 1998, 2000, 2002, 2004)

Walleye

Management objective: Maintain a walleye population with a gill-net CPUE of at least 15, a PSD range of 30-60, and a growth rate of 356 mm (14 inches) by age-3.

Walleye gill net CPUE was significantly below the management objective (Table 3), growth to age-3 was slightly below statewide, regional and large lakes means and fish condition was relatively poor (Table 2). A fingerling stocking in 2001 and a fry stocking in 2003 (Table 9) produced the only significant year classes in recent years (Table 3) indicating poor natural reproduction.

Table 3. Walleye gill-net CPUE, PSD, RSD-P, and mean Wr for Twin Lakes, Sanborn County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE		18.3		2.3		5.0		4.3		1.7	8.4
PSD		23		--		0		0		--	17
RSD-P		6		--		0		0		--	2
Mean Wr		85		--		92		79		--	87

* 5 years (1996, 1998, 2000, 2002, 2004)

Table 4. Average back-calculated lengths (mm) for each age class of walleye in Twin Lakes, Sanborn County, 2006

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2005	1	1	166							
2004	2	1	242	358						
2003	3	28	151	306	392					
2002	4	3	169	274	358	433				
2001	5	13	144	256	337	387	428			
1999	7	2	155	265	337	401	440	467	510	
All Classes		48	171	292	356	407	434	467	510	
Statewide Mean			168	279	360	425	490			
Region III Mean			173	281	367	435	517			
LLI* Mean			169	280	358	425	494			

*Large Lakes and Impoundments (>150 acres)

Black Crappie

Management objective: Maintain a black crappie population with a trap-net CPUE of at least 20 and PSD of at least 40.

Black crappie abundance has increased significantly since 2004 (Table 5) due in part to the stocking of 2,824 adults (4 per pound and 11 per acre) in 2006. As expected, the percentage of crappies over 25 cm (10 in) decreased and growth shown in Table 6 reflects the growth history of the stocked fish and resident black crappies combined. The source of the stocked fish was a lake with overabundant, slow-growing black crappies. Black crappie reproduction and recruitment is fairly consistent with several year classes present in the population (Table 6) (Figure 2).

Table 5. Black crappie trap-net CPUE, PSD, RSD-P, and mean Wr for Twin Lakes, Sanborn County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE		3.4		19.9		8.1		7.0		36.7	8.1
PSD		64		1		43		80		21	58
RSD-P		21		0		10		49		2	20
Mean Wr		101		108		121		95		94	109

* 5 years (1996, 1998, 2000, 2002, 2004)

Table 6. Average back-calculated lengths (mm) for each age class of black crappie in Twin Lakes, Sanborn County, 2006

Year Class	Age	N	Back-calculation Age							
			1	2	3	4	5	6	7	8
2005	1	86	88							
2004	2	142	74	160						
2003	3	109	75	141	180					
2002	4	15	84	151	185	208				
2001	5	11	79	151	174	194	211			
All Classes		363	80	151	180	201	211			
Statewide Mean			83	147	195	229	249			
Region III Mean			95	167	219	253	274			
LLI* Mean			89	161	210	247	271			

*Large Lakes and Impoundments (>150 acres)

Black Bullhead

Management objective: Maintain a black bullhead population with a trap-net CPUE of 100 or less.

Trap-net CPUE is far below the maximum objective of 100 per net (Table 7). The black bullhead population now contains more than one year class and some fish exceed 25 cm (10 in) (Figure 3).

Table 7. Black bullhead trap-net CPUE, PSD, RSD-P, and mean Wr for Twin Lakes, Sanborn County, 1997-2006.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Mean*
CPUE		1732.8		2345.0		628.3		2.7		1.1	1025.3
PSD		5		0		13		58		--	15
RSD-P		0		0		0		0		--	0
Mean Wr		--		--		--		88		--	88

* 5 years (1996, 1998, 2000, 2002, 2004)

All Species

Bluegill, walleye and black crappie trap net CPUE increased while CPUE of other species remained fairly stable (Table 8). The increase in desirable species may be a response to the reduced bullhead population.

Table 8. Gill-net (GN) and trap-net (TN) CPUE for all fish species sampled in Twin Lakes, Sanborn County, 1997-2006.

Species	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
NOP (GN)		2.3		0.7		1.0		1.0		--
NOP (TN)		1.1		1.5		1.7		1.1		0.3
SMB (GN)		--		0.3		--		--		--
SMB (TN)		--		0.5		1.0		0.8		--
WAE (GN)		18.3		2.3		5.0		4.3		1.7
WAE (TN)		0.8		1.6		2.8		1.2		4.3
WHB (GN)		--		--		--		--		--
WHB (TN)		--		--		0.1		--		--
BLC (GN)		0.3		1.0		--		--		1.3
BLC (TN)		3.4		19.9		8.1		7.0		36.7
BLG (GN)		--		--		--		--		--
BLG (TN)		0.1		1.7		0.5		3.2		10.1
GSF (GN)		--		--		--		--		--
GSF (TN)		--		0.3		--		--		1.2
HYB (GN)		--		--		--		--		--
HYB (TN)		--		--		0.5		0.3		0.4
OSF (GN)		--		--		--		--		--
OSF (TN)		--		--		--		--		0.1
WHC (GN)		0.3		0.7		--		--		--
WHC (TN)		--		0.8		0.2		0.1		0.2
YEP (GN)		6.3		3.7		0.3		0.7		0.7
YEP (TN)		3.6		14.3		0.1		--		0.2
BLB (GN)		73.3		69.0		35.7		0.3		1.3
BLB (TN)		1,732.8		2,345.0		628.3		2.7		1.1
BIB (GN)		--		5.7		20.7		7.7		6.7
BIB (TN)		0.1		--		1.9		0.8		0.4
COC (GN)		0.3		0.3		0.3		0.7		2.0
COC (TN)		0.2		--		0.9		0.5		0.8
SNG (GN)		--		0.3		--		--		--
SNG (TN)		--		--		--		0.2		0.3
WHS (GN)		3.0		1.3		0.7		0.3		0.3
WHS (TN)		0.6		0.5		1.5		1.0		0.4

NOP (Northern Pike), SMB (Smallmouth Bass), WAE (Walleye), WHB (White Bass), BLC (Black Crappie), BLG (Bluegill), GSF (Green Sunfish), HYB (Hybrid Sunfish), OSF (Orange-spotted Sunfish), WHC (White Crappie), YEP (Yellow Perch), BLB (Black Bullhead), BIB (Bigmouth Buffalo), COC (Common Carp), SNG (Shortnose Gar), WHS (White Sucker)

MANAGEMENT RECOMMENDATIONS

1. Stock walleye fry or fingerlings as needed to accomplish and maintain management objectives.
2. Stock black crappie adults as needed to accomplish and maintain management objectives.
3. Carefully consider the introduction of gizzard shad to provide forage for the walleye and crappie populations. Gizzard shad were abundant in the lake in the late 1980's when there were trophy pike and crappies present. However, since Twin Lakes is in the Firesteel Creek watershed, escaping shad could find their way into Lake Mitchell and potentially cause changes in that fishery.

Table 9. Stocking record for Twin Lakes, Sanborn County, 1990-2006.

Year	Number	Species	Size
1991	30,000	Walleye	Sml. Fingerling
	1,050	Bl. & Wh. Crappie	Adult
	575	Northern Pike	Adult
1992	70,000	Black Crappie	Fingerling
	500	Black Crappie	Adult
	45,000	Largemouth Bass	Med. Fingerling
	15,000	Northern Pike	Fingerling
	176	Northern Pike	Adult
1993	524,000	Walleye	Fry
	26,500	Walleye	Sml. Fingerling
1994	6,310	Walleye	Lrg. Fingerling
1995	2,600	Black Crappie	Adult
	91	Walleye	Adult
	2,913	Yellow Perch	Adult
	14,100	Yellow Perch	Adult
	38,200	Walleye	Sml. Fingerling
1996	2,620	Yellow Perch	Adult
	28,800	Walleye	Fingerling
1997	2,720	Yellow Perch	Adult
	26,200	Walleye	Fingerling
1998	13,585	Black Crappie	Juvenile
1999	26,200	Walleye	Fingerling
	11,895	Yellow Perch	Juvenile
	30,400	Walleye	Fingerling
2000	2,546	Yellow Perch	Adult
	26,640	Walleye	Fingerling
2003	262,000	Walleye	Fry
2005	26,400	Walleye	Fingerling
2006	27,000	Walleye	Fingerling
	2,824	Black Crappie	Adult

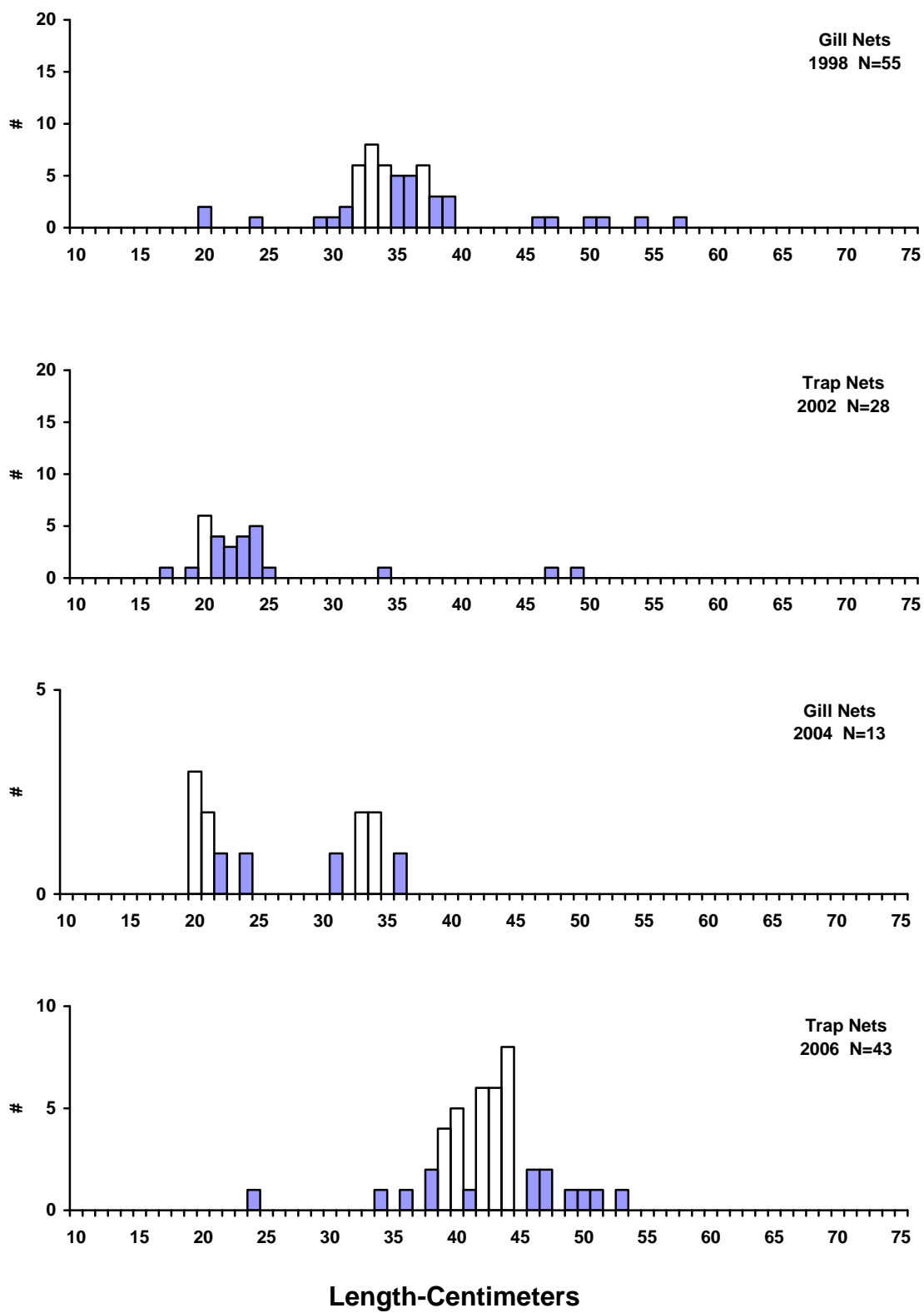


Figure 1. Length frequency histograms for walleye sampled with gill nets or trap nets in Twin Lakes, Sanborn County, 1998, 2002, 2004, 2006.

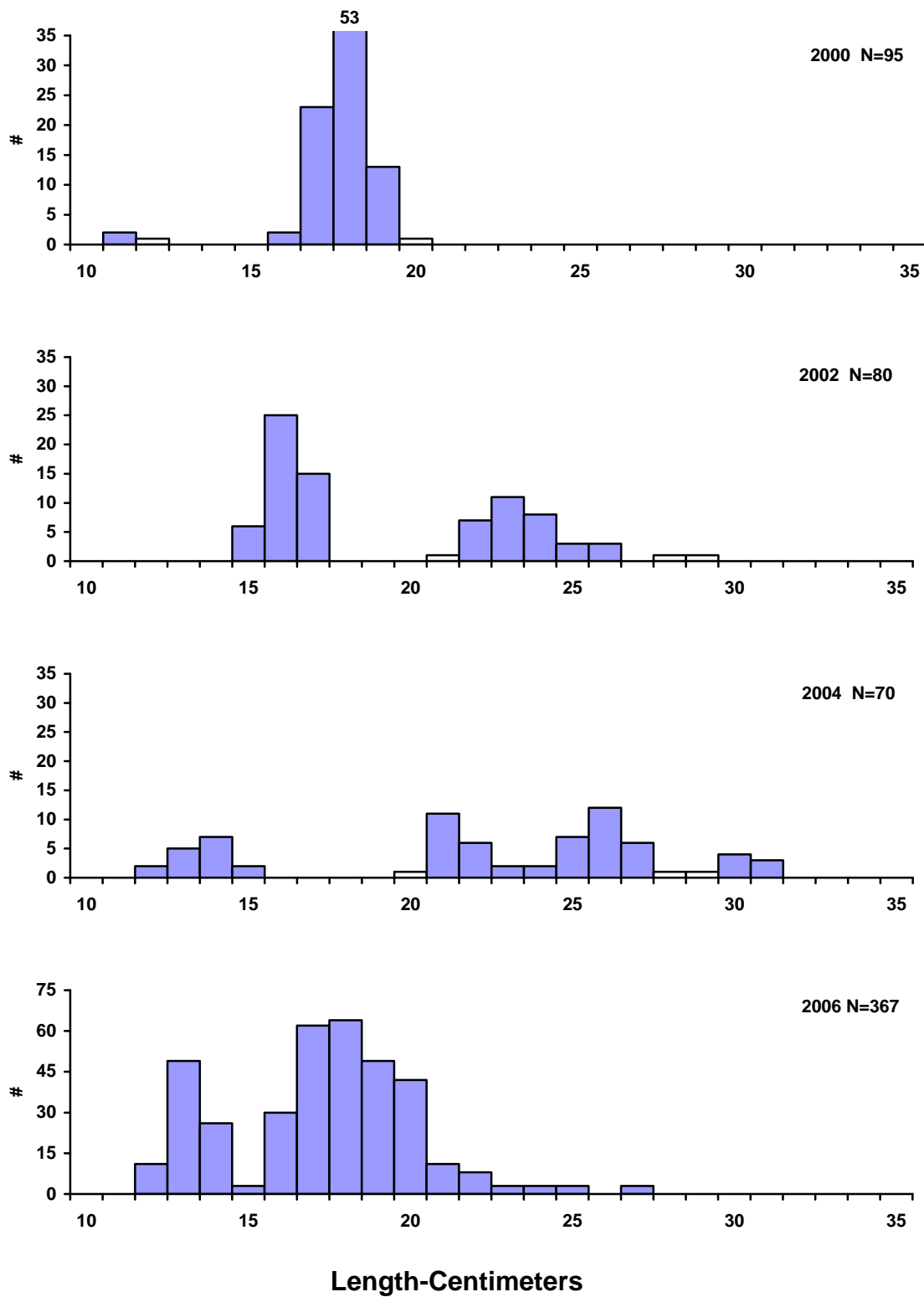


Figure 2. Length frequency histograms for black crappie sampled with trap nets in Twin Lakes, Sanborn County, 2000, 2002, 2004, 2006.

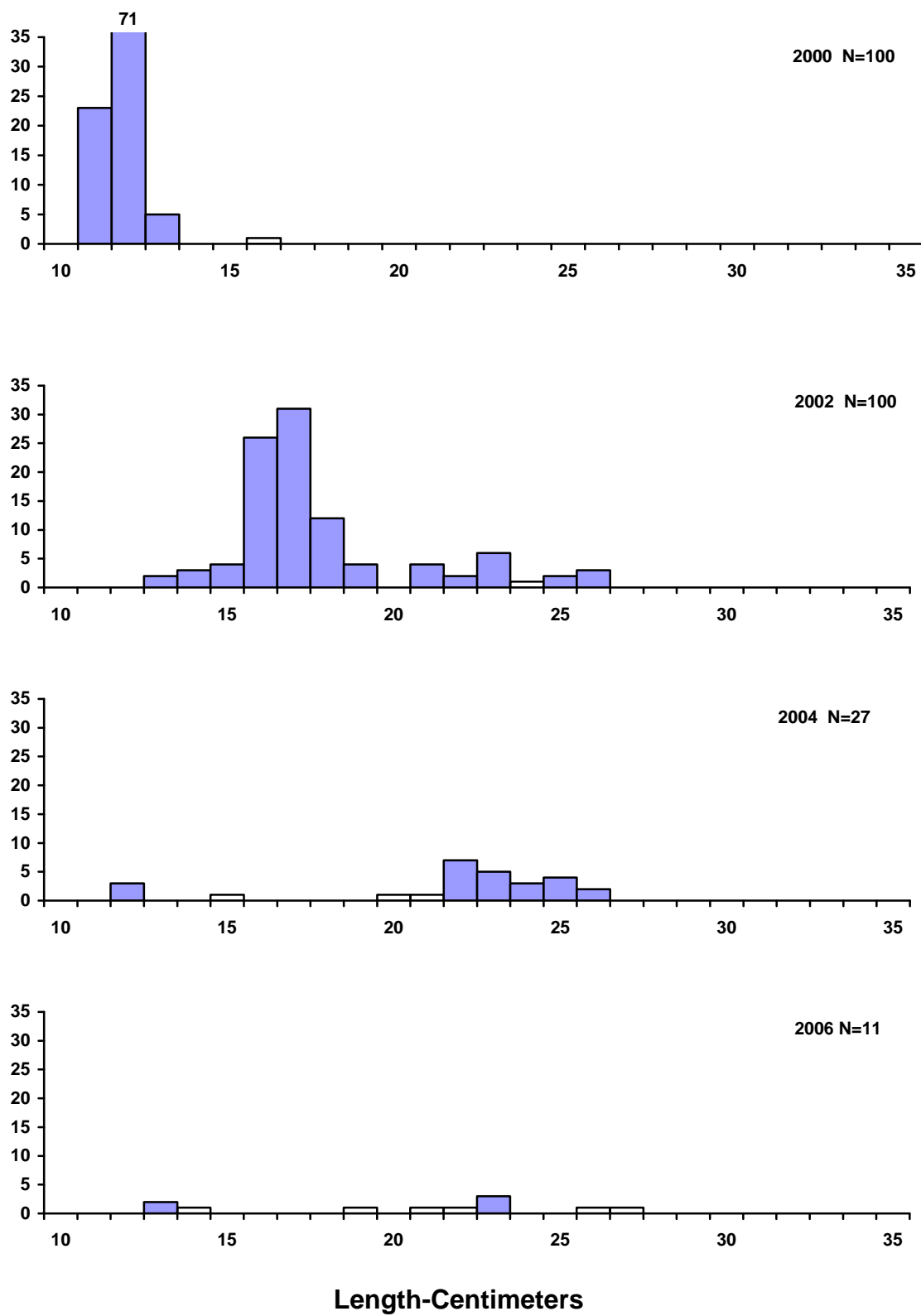
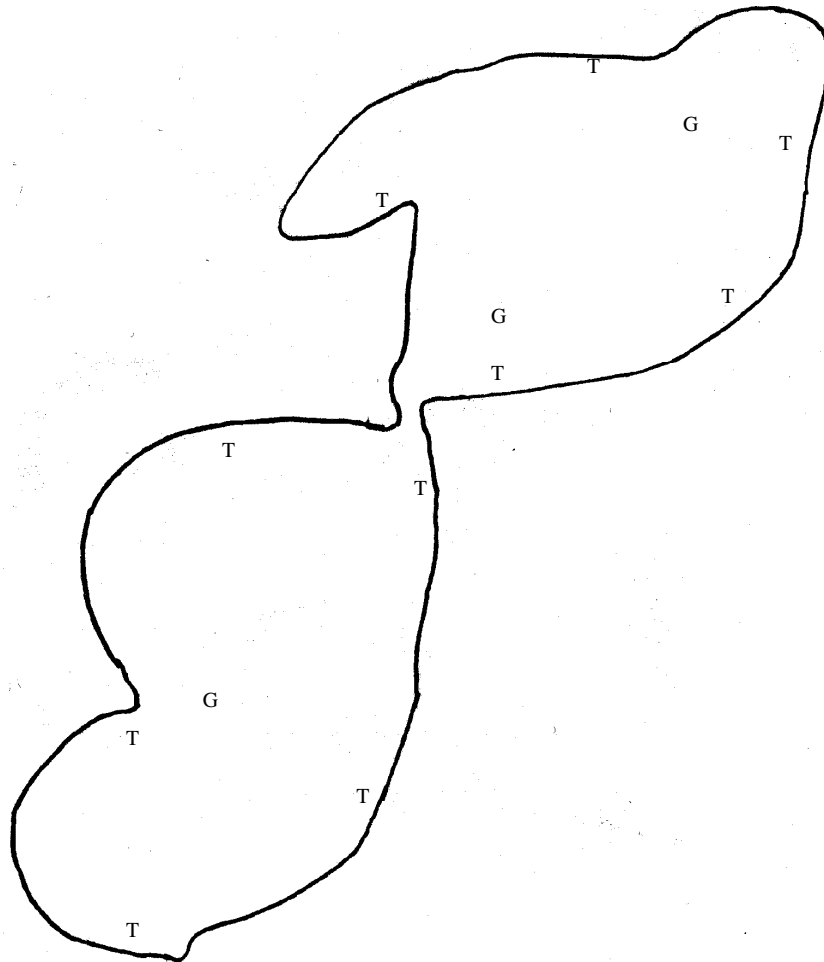


Figure 3. Length frequency histograms for black bullheads sampled with trap nets in Twin Lakes, Sanborn County, 2000, 2002, 2004, 2006.



Legend
Gill Nets: G
Trap Nets: T

Figure 4. Sampling locations on Twin Lakes, Sanborn County, 2006.

Appendix A. A brief explanation of catch per unit effort (CPUE), proportional stock density (PSD), relative stock density (RSD) and relative weight (Wr).

Catch Per Unit Effort (CPUE) is the catch of animals in numbers or in weight taken by a defined period of effort. Can refer to trap-net nights of effort, gill-net nights of effort, catch per hour of electrofishing, etc.

Proportional Stock Density (PSD) is calculated by the following formula:

$$\text{PSD} = \frac{\text{Number of fish} > \text{quality length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

Relative Stock Density (RSD-P) is calculated by the following formula:

$$\text{RSD-P} = \frac{\text{Number of fish} > \text{preferred length}}{\text{Number of fish} \geq \text{stock length}} \times 100$$

PSD and RSD-P are unitless and usually calculated to the nearest whole digit.

Size categories for selected species found in Region 3 lake surveys, in centimeters.

Species	Stock	Quality	Preferred	Memorable	Trophy
Walleye	25	38	51	63	76
Sauger	20	30	38	51	63
Yellow perch	13	20	25	30	38
Black crappie	13	20	25	30	38
White crappie	13	20	25	30	38
Bluegill	8	15	20	25	30
Largemouth bass	20	30	38	51	63
Smallmouth bass	18	28	35	43	51
Northern pike	35	53	71	86	112
Channel catfish	28	41	61	71	91
Black bullhead	15	23	30	38	46
Common carp	28	41	53	66	84
Bigmouth buffalo	28	41	53	66	84
Smallmouth buffalo	28	41	53	66	84

For most fish, 30-60 or 40-70 are typical objective ranges for “balanced” populations. Values less than the objective range indicate a population dominated by small fish while values greater than the objective range indicate a population comprised mainly of large fish.

Relative weight (Wr) is a condition index that quantifies fish condition (i.e., how much does a fish weigh for its length). A Wr range of 90-100 is a typical objective for most fish species. When mean Wr values are well below 100 for a size group, problems may exist in food and feeding relationships. When mean Wr values are well above 100 for a size group, fish may not be making the best use of available prey.